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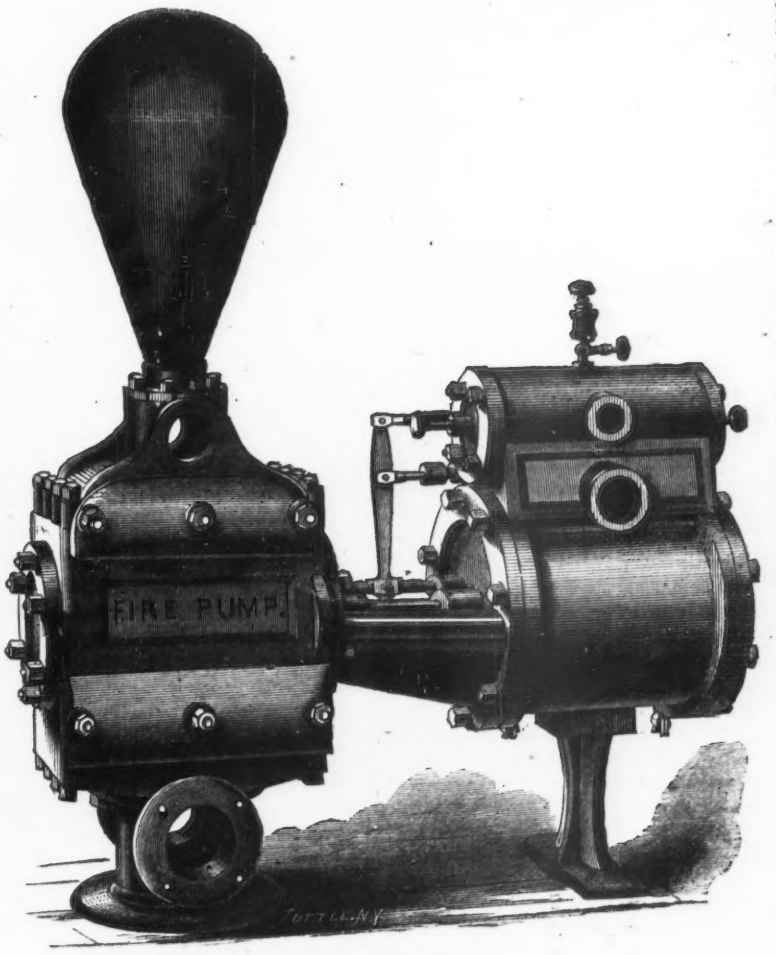
Blake's Patent Fire Pump.

It is but a few years since the direct-acting steam pump was invented, and yet to how many different uses is it applied? Not among the least of its many services is that of an independent fire engine. Amongst the manufactures and corporations in New England, no factory is considered complete without one or more of these fire pumps, and so necessary have they become that leading insurance companies refuse to take risks on manufacturing property that is not thus protected.

Since the disastrous fires that destroyed so much property, and, what is more irreparable—so many valuable lives—at Avondale, Plymouth and Pittston, Pa., the attention of the corporations and operators throughout the mining regions have been called to the necessity of adapting some measure by which fires would be arrested or prevented altogether, and no measures have proved so satisfactory as to place independent fire pumps in each breaker, so that so long as work was being carried on, it would be next to impossible for a fire to attain any headway before a half dozen streams could be brought to bear on it.

The accompanying cut represents a medium size "Blake" fire pump, 14 inch steam cylinder, 7 inch water cylinder, and 12 inch stroke, and represents the patent valve motion, for reducing the length of stroke of pump, and the speed of the slide valve. By the use of this valve motion, it is claimed that the pump can be built in the most compact manner, requiring much less floor room than a pump of same given dimensions of any other manufacture. This short connection enables the pump to do greater work than any other, while it can run at faster speed, without injury or "thumping.'

We understand that this pump has been placed in some of the largest and most valuable *breakers* in the anthracite regions, and has been and is being adopted generally throughout the coal districts. We venture to say when each breaker is provided with an efficient *fire pump* of sufficient capacity, we will hear no more of Avondale and similar disasters.



BLAKE'S PATENT FIRE PUMP.

Mineral Species in Utah.

BY W. P. BLAKE.

THIS Territory promises to add largely to the list of mineral species known to occur west of the Rocky Mountains. The following notes, from personal observation, are given as the beginning merely of a complete list.

Galena.—This is widely distributed through the mineral district, being the chief silver-bearing ore of most of the mines in the limestone formation. By its decomposition, together with that of the iron pyrites and antimonial minerals associated with it, it yields peculiar earthy looking ores, holding silver either as oxide or chloride or both. In the Emma Mine, the galena occurs chiefly upon the hanging wall where it has often been found exposed over several square yards of surface in glittering masses, from a few inches to one or two feet in diameter. Much of it was fibrous in structure, with a dull gray color, and apparently mixed with sulphuret of antimony. The galena from this mine carries from $94 to $238—value in silver per ton of 2000 pounds. It occurs, not only massive upon the hanging wall, but also in nodules, disseminated in a dolomitic breccia, intercalated in the ore-mass.

Cerussite.—Carbonate of lead is commonly present in the upper portions of the galena-bearing deposits, either in solid amorphous crusts or nodules, or in small crystals. It the latter form it occurs abundantly in the ore of the Savage, Flag-staff, Davenport, and Emma mines, in Little Cottonwood Cañon.

Wulfenite.—Molybdate of lead, in thin tabular crystals, and orange-yellow in color, is abundantly disseminated in the ore of some of the claims in Little Cottonwood, particularly in the Savage and the Flag-staff.

Massicot.—Oxide of lead in the earthy ochreous form is common in the decomposed ores of many of the veins in the limestone rocks. According to Mr. J. B. MEADER, it occurs in a very pure state in one of the claims at West Tintic with Minium.

Native Copper with Red oxide of Copper.—In a claim near Ogden.

Melaconite.—Black oxide of copper has been taken in shipping quantities from parts of the Mammoth claim, Tintic district.

Chrysocolla.—In seams and masses varying in color from green to a light blue, associated with melaconite in the Mammoth.

Malachite and Azurite.—These species are found in beautiful specimens associated in the King David mine, Eureka Hill, and at the Mammoth Copper claim in Tintic district. They are found also at the Armstong and other localities.

Enargite.—In quantity in the Shoebridge claim, Tintic, associated with iron pyrites. Some of the masses contain cavities lined with small crystals, about one-tenth of an inch in length and in diameter.

The brittle prismatic ore in divergent blades extending through the gangue, found at the Mammoth mine, is probably this species, though its appearance is different. It contains a large amount of arsenic. A dark colored, steel gray prismatic mineral with well defined cleavage, found near Salt Lake, may be likewise referred to this species, though a blowpipe examination of a small quantity gives reactions very different from those characterizing the Shoebridge mineral. There appears to be more arsenic and less sulphur in it. It fuses easily and with little decrepitation, being in this respect very different from the enargite of the Shoebridge. It is also harder. This mineral and that from the Mammoth mine require further examination.

Jamesonite.—A steel-gray mineral in plumose needle-like aggregations, associated with blende in quartz, is referred to this species. It was collected and forwarded to me by Mr. MEADER. It is probable that this species occurs in the Emma mine, and in other similar deposits where the surface ores are characterized by the presence of antimony with the

oxide and carbonate of lead.

Bismuthinite.—A vein containing considerable quantities of this mineral, has been opened by Mr. MEADER in the southern part of the Territory. It is associated with pyrites, brown dodecahedral garnets and hornblende. There is also some bismuth-ochre.

Cinnabar.—In Camp Floyd district.

Horn Silver.—At the Silveropolis claim, and at the Mountain Tiger and other claims in East Cañon district; in thin scales and crusts on quartz at the Sparrow Hawk in Camp Floyd. It is probably present in disseminated films throughout much of the ore of the various districts.

Rock Salt.—Southern Utah, and the valley of the Colorado beyond, are remarkable for localities of salt of great purity and in enormous beds. A locality near Gunnison, on the Sevier river in the Wahsatch range, is now yielding immense quantities of a tolerably pure salt, mixed somewhat with red clay. It is said to form a mountain and is quarried by blasting, tons being thrown off at a time.

Well crystallized specimens, suitable for cabinets, are obtained artificially by solar evaporation from the water of Salt Lake. The water of this lake is not so strongly saturated with salt as formerly. It has been growing fresher for several years past.

The *tin ore*, so called, said to occur near Ogden has been shown by competent mineralogists and chemists not to contain any tin. Well authenticated specimens sent to me not only do not contain tin, but do not resemble any of the ores of tin. It is probable that deception has also been practiced in regard to the specimens of *sal ammoniac* shown in Salt Lake City last summer as having been dug from a hill in the southern part of the Territory. The specimens were probably broken from commercial masses.

Carbonic Acid Gas.—This is common in ill-ventilated mines in most of the districts, and in such quantity in some shafts, as to extinguish the flame of a candle.

Talc.—A variety of talc in small silky scales and of a beautiful green color is found in the Davenport mine. It appears to contain copper. It is infusible, blackens, and gives a green flame.

Scientific Notes.

The following notes of scientific progress were read by Prof. S. D. TILLMAN, at a recent meeting of the Polytechnic Association of the American Institute.

NEW FORM OF SENSITIVE FLAME.—Mr. Philip Barry, of Cork, Ireland, has devised a new method of making a sensitive flame, of which he writes to Professor Tyndall, as follows:—It is in my experience the most sensitive of all sensitive flames, though from its smaller size it is not so striking as your vowel flame. It possesses the advantage that the ordinary pressure in the gas mains is quite sufficient to develop it. The method of producing it consists in igniting the gas (ordinary coal gas), not at the burner, but some inches above it, by interposing a piece of wire gauze between the burner and the flame. The piece of wire gauze (32 meshes to the inch) is supported about two inches above the burner. On turning on the gas and lighting it above the gauze a flame is obtained in the shape of a slender cone, four inches high, the upper portion giving a bright yellow light, the base being a non-luminous blue flame. At the least noise this flame roars, at the same time flattening itself upon the gauze, and becoming almost invisible; it is very active in its responses, and being rather noisy, appeals to the ear as well as the eye. It does not appear to distinguish the vowel sounds so well as the vowel flame proper. To A it is extremely sensitive, less so to I, but slightly sensitive to E and U, and O has no influence upon it whatever. To the sounds coming from a small music box it dances in the most perfect manner, and is highly sensitive to most of the sonorous vibrations which effect other flames.

Prof. THURSTON. Some interesting experiments have lately been tried by Dr. MAYER, at the STEVENS Institute. Several methods were employed for making the tubes, but the most successful one was to draw out one end of a glass tube, one-fourth of an inch in diameter, to a point, and file it and try it until it produced its maximum effect. The most successful one was a tube of about 3-16th of an inch internal diameter, tapered down to nearly one-eighth of an inch, and the flame was more than a foot high. The jingle of a key, or sounding the letter S, across the room, would bring it down to about one-third, and it would then make the loud rustling sound that gas flames produce when the pressure is too great. We obtained uniform success with brass tubes one-fourth of an inch in diameter, by soldering a plate upon the top and reaming it out until the hole was the most successful size.

The PRESIDENT, These flames may lead to the discovery of one thing hitherto entirely unexplained, with regard to the production of sounds. We know that the pitch of musical sound depends entirely upon the rapidity of the vibrations of the air, the "middle C" producing 522 vibrations in a second. But consonant sounds do not depend at all upon pitch; and we do not know on what the expression of a consonant depends. The sound of S affects this flame very much, and this may help to solve the problem. The only theory I can conceive of, is that the consonant sounds produce a roughening of the waves, like the crest of waves breaking upon the shore.

Prof. THURSTON, We found that when the flame was most sensitive, a variety of sounds, at different pitches, would produce the same effect. It may be that greater care will make the flame still more sensitive, and diminish the range, so that each tube will be affected by a particular kind of sound. The subject has not yet been sufficiently investigated to determine this. Within the limits of the room, we could not discover that the distance of the sound had any effect upon the result.

Dr. RICHARDS, The statement that the vowel O did not affect the flame coincides with the statement of Prof. THURSTON that sharp sounds do affect it.

Dr. VAN DER WEYDE, I experimented on this subject ten years ago, and took out a patent for a gas alarm on the same principle, but it would not always act, and its unreliability made it useless. Take an Argand burner, and put it over a disc of wire gauze, and it will have the effects of a Bunsen burner. Put over that a tube of the proper length, and you will get a sound. With a stovepipe it will roar like a lion. Above this was a very small flame always burning, so as to light the other when the gas was turned on by opening a door or window. In Philadelphia, we made an organ on the same principle, taking pipes of different sizes. Unfortunately, as the pipe was heated the pitch kept rising, and the discord was horrible.

The PRESIDENT, This invention of Mr. BARRY is only a modification of that of Dr. VAN DER WEYDE.

SOUNDS FROM THE AURORA.

At a recent meeting of the French Academy of Sciences, Becquirel expressed the opinion that the Aurora does produce sound, and in confirmation of this view cites the observation of PAUL ROLLIER, æronaut, who started from Paris, in December last and descended 14 hours after in Norway on Mount Ida at an elevation of 4000 feet. "I saw, through a thin fog, the moving of the brilliant rays of an aurora borealis, spreading all around its strange light. Soon after, an incomprehensible and loud roaring was heard, which, when it ceased completely was followed by a strong smell of sulphur, almost suffocating." Profesor LOOMIS and other meteorologists have seen no satisfactory evidence that the Aurora ever emits any audible sound, believing that the noises ascribed to the Aurora are due to other causes such as the wind, or to that low temperature of snow and ice which sometimes produces sudden movement.

Dr. VAN DER WEYDE.—The Aurora acts upon the needle like an electric current, and must be electric. It cannot be the reflection of the sun's light, for we find the solar lines in everything the sun shines on; but the Aurora, when we turn the spectroscope upon it, does not give us the solar lines, but those of the corona. If the Aurora is electric, it is probable that there will be sound.

Dr. FEUCHTWANGER.—In cold climates, electricity is more developed than in warm climates: and that indicates that the phenomenon is probably electrical.

Dr. VAN DER WEYDE.—The center always corresponds to the magnetic pole, even when the magnetic variation is as much as 20°.

Dr. PARMLEE.—Two things render it very improbable that the Aurora produces an audible sound; its elevated position, and its great attenuation. It extends to a great height; and it is so attenuated that the stars are visible through it. It is highly improbable that there could be much sound produced under such circumstances, and still more improbable that the sound could reach the earth.

The PRESIDENT.—This gentleman was up in a balloon.

Dr. PARMLEE.—He was not more than five miles high; and the Aurora is stated to extend to a height of several hundred miles.

Dr. VAN DER WEYDE.—A noise high up does not easily come down. I consider the Aurora as a thunder storm in a climate so cold that there is no water. Clouds are positively electric. In the far north where no evaporation takes place, the upper atmosphere becomes charged with electricity. The medium above the planetary atmosphere is a good conductor of electricity; and this electricity may be discharged by the route to the equator through the rare atmosphere, which may extend three or four hundred miles high. The question is whether the sound can penetrate the atmosphere so as to reach the earth.

Mr. HUDSON.—Why is it, if the Aurora is so elevated, that the currents affect the telegraph wires?

Dr. VAN DER WEYDE.—By induction. They do not come down. When you have a current through a wire, there will be an induced current through a parallel wire, without any apparent connection. It depends on the variation of the current; for if the upper current is constant there is no lower current.

The PRESIDENT.—No force can leap through a vacuum. Induction is probably produced by a change in the polarity of the atoms of the intervening atmosphere, or of the other which pervades the atmosphere.

Dr. RICHARDS.—Medical experts consider it settled that the induced current has a different medical effect from the direct current. With regard to the noise, if direct testimony is worth anything, I stand here as a witness. In the middle of a pleasant September night, when there was a very brilliant Aurora spanning the whole sky, I observed that as the belt of light widened or narrowed, there was an evident noise, almost simultaneous with it. I stopped my horse, and spent about an hour in observing it. That was about the year 1830. It might have been a wind which produced the effect upon the Aurora, which wind I heard; but there was certainly a coincidence between the sound and the motion of the Aurora.

Dr. VAN DER WEYDE.—If the Aurora was 600 miles high, it would take an hour for the sound to reach the earth.

Mr. PARTRIDGE.—In the winter of 1860, 500 miles north of here, with the thermometer 20° below zero, the snow two or three feet deep, on a perfectly quiet night, during a brilliant Aurora, I heard sounds very like the clacking of two pieces of horn. I was watching for sounds from the Aurora, and sounds I heard; but whether from that or from the movement of the snow in the extreme cold weather, I cannot say.

Mr. HUDSON.—During one of the finest Auroras I have ever seen, in 1866 or 1867, when it was perfectly still, and I was entirely alone, with no wind no snow, no ice, no intense cold, it seemed to me that I could hear a crackling sound. Still, I could

not be sure that it was not imagination, having so often heard it described.

Dr. PARMLEE.—We have had three witnesses who have heard three distinct sounds, the clacking of two piecs of horn, the wind sighing through the boughs, and a crackling sound. I venture to say that any person, on any perfectly still night in the country, if he will listen, will hear a great variety of sounds, some of them perhaps in his own ears. Throwing the head back, may itself cause a rush of blood to the head, which will produce a roaring noise.

Mr. PAREBIDGE.—I have listened for the same sounds on other nights, but failed to hear them.

Notes on Lead Smelting in Nevada and Utah.

BY O. H. HAHN, M. E.

[CONTINUED FROM PAGE 338 OF LAST VOLUME.]

In selecting a furnace-site a great many things have to be taken into consideration in regard to the economical part as well as to the technical. To answer the latter, three conditions are necessary: a sufficiency of water, a spacious ore-floor and a convenient slag-dump. The lack of one or all of these conditions puts a smelter to great inconvenience and may even cause a financial failure. After having graded off a suitable location for a furnace at the side of a gently sloping hill, a square or rectangular excavation is made in the ground to receive the foundation. The area is generally 8x10 or 10x10 ft., the depth depending upon the condition of the subjacent ground. If the same be directly on the bed-rock, as in the instance of the Eureka Company's furnaces, no foundation is required, and a depth of 3 or 4 ft. is sufficient to receive the furnace masonry proper; but if it be moist or in gravel, a depth of from 7 to 14 ft. is judicious. The foundation is made of undressed rocks which are laid in lime-mortar, or better in cement. The largest ones are used for corners and the joints must be filled up with spalls. The topmost course on which the furnace is to be built ought to consist of dressed stones, well seasoned, sandstones if possible. The joints must be perfectly tight. In some instances it is desirable to make provisions for draining off the surface-water by arched channels, as the furnace-bottom ought to be absolutely dry.

If the furnace is intended to be provided with hearth-plates, like the one described, those, as well as the cast iron pillars are to be put in place now. Then the inside of the hearth-plates is carried up of sandstone blocks 2 feet wide by 1 foot thick, leaving sufficient room for the tap-holes and an open space at the dam-plate. As soon as the mason work has progressed to 7 inches above the plates, the tuyeres are placed in position and walled in with fire-bricks or sandstone. Three feet above the dam-plate the arch over the breast is started and the masonry continued to a level with the top of the pillars. Then, the flange which is to bear the upper part of the furnace is put in its place and well bolted to the pillars. The flange is 2 in. thick. The part of the furnace above this flange may consist of inferior sandstone or even common brick, 1 ft. or 18 in. thick, as it is less affected by the heat and corrosive action of the ore. About 6 in. or 1 foot above the charging floor the chimney for carrying off the fumes is started and continued to a height of from 12 to 15 ft., leaving out spaces for the feed-holes 3 ft. wide by 2½ ft. high, at two opposite walls. The chimney ought to have a sufficient opening—say 3 ft.—at the top to prevent the smoke from issuing through the feed-holes into the charging room. The use of sheet-iron smoke-stacks is objectionable, as they always get red-hot in the operation of lighting up and blowing out a furnace and then rapidly yield to the corroding action of the oxygen of the air.

To keep the masonwork from spreading it is braced by a sufficient number of wrought or cast-iron uprights, which are sustained in position by wrought-iron bands passing over them, which are bolted together. The first bands are laid round the furnace about 2 ft. above the dam-plate, and then follow one another in spaces 1 ft. apart. The upper part of the furnace, if made of brick, may be enclosed in a sheet-iron shell (Richmond and Winamuck Co's. furnaces), if of stone, bands and uprights will answer just as well. The same remarks are applicable to the chimney.

Now, the foundation is covered with soil made firm by pounding to within three ft. below the upper edge of the plates, and a track made for the slag-trucks. After having connected the tuyeres with the water-tank by wrought-iron pipes of convenient size (¾ or 1¼ in.) the work of seasoning commences. A fire of billet-wood is kept in the furnace, slowly and steadily increasing for about two weeks. During that time the bolts ought to be loosened to prevent the stones or bricks from being cracked by the escaping moisture. As soon as the furnace-walls get warm outside and no more moisture is perceptible in the joints the furnace is ready for use. The fire is withdrawn and the furnace cooled down enough to allow a man to work inside. The bottom stone, previously put in, is now provided with a thin coating of clay or brasque (a composition of powdered charcoal and clay in varying proportions) which is rammed in with a wooden stamper, after wetting it until it just coheres in lumps. The dam is made in the same manner but of very good fire-clay and taking care to make it extremely hard. It has a steep pitch towards the bottom. The tap-hole is made by pounding clay into the space left for that purpose and turning a pointed stick on the outside round a central axis, thus describing a cone. The tap-hole may be in the front plate which is best, or in a side of the furnace. Generally a large furnace has two tap-holes on opposite sides and at right angles with the front plates. One tap-hole is at the deepest point of the bottom, the other one a few inches above it. Thus the metal may be tapped high or drawn off entirely, according to the circumstances. Mr. ARENTS, of the Eureka Consolidated Works, recently made an attempt to do away with the inconvenient mode of tapping hitherto in use, and his efforts have been crowned with such success that there is not a single furnace in Eureka without this peculiar contrivance, termed the *syphon-tap* or *automatic tap*. Its advantages have been fully demonstrated in a former number of THE ENGINEERING AND MINING JOURNAL. This tap consists of a sheet-iron shell which is bolted to one of the furnace plates. Six inches from its top there is a hole through which a 3 in. wrought iron pipe passes slantingly through another hole in the plate to the lowest point of the furnace. This cylinder is now filled up by ramming in clay; a bowl 18 in. in diameter is then cut out, which communicates with the pipe. The surface of this bowl is on a level about 1 in. lower than the lowest point of the mattespout, so that no lead can escape through the latter. Through this arrangement the lead is always kept on the same level while the furnace is running; only after blowing out the lead remaining inside is drawn off through the tap-hole into the *lead well*. The latter is made by digging out a hole of convenient size in front of the tap-hole, running in grouted clay a few inches above the floor and cutting out a bowl of 40 in. diameter and 18 in. depth. As soon as the bottom is made the breast must be put in. About 6 in. above the front plate a straight arch, called the *bridge*, is started of firebricks. In accordance with the thickness of the breast desired, they are laid longwise or edgewise. At Eureka the breast is made 9 in. thick, although 4 in. would be sufficient. A fire is now started in the hearth, syphon tap and lead-well to dry them. In the hearth the fire is continued till it gets red hot. This is done by filling the hearth with lump coal and kindling it. After it is all burnt down the ashes are withdrawn and a fresh fire is started. These operations are continued till the desired end is accomplished, which generally takes two days.

Ores. The majority of smelting ores with which the smelters of Utah and Nevada have to deal are galena and the carbonates, sulpho-carbonates and antimoniates of lead.

According to the quantity and quality of the gangue we may classify them as:

1. Ores containing all the slag-forming ingredients (oxide of iron, silica, lime,) in the proper proportions; or *neutral* ores (Eureka Cons. Co's. mines).

2. *Basic ores* with lime and oxide of iron or manganese and no silica or not in sufficient quantities (White Pine, East Cañon, Cottonwood, Eureka, Nev.)

3. *Acid or hard ores* with silica and clay prevailing (Bingham Cañon, Stockton, Tintic? Humboldt?).

Provided the slag-forming ingredients alone be present *galena ores* when passed through a blast-furnace do not yield metallic lead at once, but a mixture of metallic lead with sulphuret of lead, (*lead-regulus, matte*) and other sulphurets if such be present—an article that finds no market. In order to produce metallic lead galenas may be smelted with an addition of metallic iron (5 per ct. or more according to circumstances) or after roasting.

In the first case the iron unites with the sulphur of the galena to a sulphuret of iron called *iron matte*, and metallic lead is set free. This reaction is, however, not complete, as a considerable quantity of sulphuret of lead, and with it silver, is retained by the iron-matte, necessitating another roasting and smelting operation. The iron-matte being lighter than the lead floats on the top of the latter and thus can be easily separated from it after cooling.

The combined *roasting* and *smelting process* is preferable to the *iron reduction* process. The galena is first roasted in heaps, stalls or reverberatory furnaces. Roasting in heaps and stalls is cheaper, as the ore may be used in lumps and no expensive apparatus is required, but it is more tedious and incomplete, and only suited for galenas containing a large percentage of sulphurets of iron or copper. The latter prevents the ore from smelting together and so stopping the roasting process.

The roasting in reverberatories is by all means the best preparation of galena ores for smelting. In this country it is generally done in small Mexican furnaces, called *galmadors*, (a corruption of galenadores) of the shape given in KUSTEL's Nevada and California processes. After the roasting operation is finished the heat is so increased that the ore is converted into a thick slag, principally *silicate of lead*, which is drawn out of the furnace, cooled and broken up into large pieces of convenient size. The agglomerated ore is then passed through the blast-furnace with the proper quantity of fluxes (Cerro Gordo, Cal., Big Cottonwood, Corinne). The quantity agglomerated is 10 tons in 24 hours at a cost of about $4 per ton.

Before smelting the ores ought to be reduced to the proper size. Some of the Eureka ores yielding a very basic slag may be thrown into the furnace in any size without disturbing the smelting operations, (Richmond Co's. ore). But siliceous and calcareous ores ought to be reduced to pea-size in a battery, unless this is done no furnace can be run without sledge and bar.

Ores carrying much oxide of iron like the White Pine ores ought to be agglomerated in conjunction with quartz in a reverberatory furnace. Hereby the oxide of iron is slagged and cannot be reduced to metallic iron by subsequent smelting in a blast-furnace. Metallic iron not finding heat enough in a lead furnace to keep it sufficiently fluid to run out with the slag congeals in the hearth and forms what smelters term *sows, bears, horses, salamanders*. These names indicate the aversion of lead-smelters against accummulation of metallic iron in the furnace.

Very fine ores ought to be agglutinated by milk of lime or agglomerated in a reverberatory as they either escape from the top of the furnace or roll through the charge and arrive raw before the tuyeres, thereby forming nozzles and deranging the furnace.

The *Eureka ores* are principally bog-ores with

argentiferous and auriferous carbonates of lead interspersed, probably products of these metals, remainders of which are still found mixed with the ore. The iron ore is chiefly in the shape of hydrated oxide of iron, but streaks of pittizite arsenide and sulphide of iron are frequent, and phosphates of iron probably occur although they have not yet been observed. The principal lead ores are cerussite, mimetite and galena in pockets. But wulfenite (molybdenate of lead) has been found very frequently in cavities beautifully crystallized. Owing to the presence of arsenic and sulphur in these ores, no reduction of metallic iron need be feared as this metal is carried off in the shape of a mixed sulphuret and arseniuret of iron, termed *matt* or *speis*, a very fusible compound.

The percentage of gold in these ores decreases with the rise in the percentage of lead. The reverse (Ruby Hill ores) is the case with the silver. There are, however, zones of lead ore which do not carry gold at all and only about 30 gr. of silver per ton, (Bullwhacker mine). I think the average of the ores delivered at the smelting works of Eureka is about 25 per cent., value of gold and silver varying. Formerly even ores with only 6 and 8 per cent. of lead were smelted in one establishment along with dry ores, the resulting lead was very rich, sometimes running up as high as $1500 in gold and silver, but the matt was also rich assaying about $70 in gold and silver. As matt requires additional expensive operations to extract the useful metals from it, it is better to make it as poor as possible and throw it over the dump, To do this we have to observe the metallurgical principle: the more lead in the charge, the less of the noble metals will go into the bye-products.

[TO BE CONTINUED.]

Iron in the United States.

We copy the following interesting statistics from the *U. S. RR. and Mining Register* of Dec. 30:

As the consumption of iron is held to measure the progress of a people in manufactures, in industry, and to some extent in civilization also, the statistics of its production and importation have a high social value. The following are, with regard to this country, though not absolutely perfect, the best now attainable:

The aggregate product of pig iron in this country has increased from less than three-fourths of a million tons (of 2,000 lbs. each) in 1854, to nearly or quite two millions of tons in 1871. The returns for the several years are as follows:

Year.	*Product.*	*Year.*	*Product.*
1854	736,218 tons.	1864	1,135,497 tons.
1855	784,178 "	1865	931,582 "
1856	883,187 "	1866	1,350,943 "
1857	798,157 "	1867	1,461,626 "
1859	840,627 "	1868	1,603,000 "
1860	919,770 "	1869	1,916,641 "
1861	731,544 "	1870	1,900,000 "
1862	787,662 "	1871	2,000,000 "
1863	947,604 "		

[NOTE.—Our civil war doubtless reduced the product of 1861-2. The reduction in 1870 of the duty on imported pig from $9 to $7 per ton has doubtless checked the growth of iron smelting in this country.]

Of railroad bars (not steel), the domestic product has grown pretty steadily from 24,315 tons in 1849 to 620,000 tons in 1870, and probably somewhat more in 1871, though the rapid growth of the production of steel rails within the last two or three years may have checked the growth of the iron rail manufacture. Of the iron rails rolled in 1869, the production (in tons) was distributed as follows:

Massachusetts	32,238	New York	79,463
Pennsylvania	319,653	Maryland	27,328
Ohio	41,837	Kentucky	7,817
Michigan	6,885	Illinois	53,261
Wisconsin	8,680	Other States	16,424
Total			593,586

Of the production of steel rails, we have no full statistics, though it is known to be large and very rapidly increasing. It was reported at 8,500 tons in 1868, 12,000 tons in 1869, and 45,000 tons in 1870. We judge that it must have reached 60,000 tons in 1871; but this is an estimate merely. No intelligent observer can doubt that steel rails are to supersede iron on all great railroads, and at the turnouts and sidings even of the smaller. Though their first cost is some fifty per cent. greater, they last so much longer than iron that a great economy is secured by the use of steel rails. Our total production of steel (rails included) is returned as follows:

Year.	*Tons.*	*Year.*	*Tons.*
1865	15,262	1868	30,000
1866	18,973	1869	35,200
1867	19,000	1870	75,000

We hope to learn that the product of 1871 was not less than 100,000 tons. At all events, it has rapidly increased, and is still increasing. Recent inventions and discoveries by our countrymen justify the hope that we shall, within a few years, be able to convert a ton of pig iron into a ton of steel at about the cost of the pig—that is to say, two tons of pig iron will buy a ton of steel of middling quality. The striking improvements in the art of steel making invented by our countrymen within the last five years fully warrant this presumption.

Our importations of iron and steel are made almost exclusively from Great Britain; and these, too, have been pretty steadily enlarged, but not so rapidly as our home production. According to the British official statistics, there were exported from Great Britain to the United States, in 1850, 295,521 tons of iron of all kinds, which was swelled in 1853 to 518,000 tons. Thenceforth, it fluctuated from 385,899 tons in 1856 to 243,583 tons in 1859, and in 1862 (our civil war having put a stop to railroad making) it sunk to 53,236 tons. Thence it has pretty steadily risen, so that it reached 596,554 tons in 1869, and has gone still higher in the two subsequent years whereof we have no full statistics.

[NOTE.—These returns are given in tons of 2,000 pounds each, as in the case of our American product. They will not coincide with our custom returns, being given for each *calendar* year; whereas our *fiscal* year closes with June.]

Great Britain has exported railroad iron to all countries (about half of it to the United States) as follows:

Year.	*Tons. (2,000 lbs.)*	*Year.*	*Tons. (2,000 lbs.)*
1860	507,858	1866	557,783
1861	422,873	1867	650,239
1862	448,857	1868	653,507
1863	500,013	1869	1,003,350
1864	457,200	1870	1,187,337
1865	486,427		

Of this aggregate, 336,500 tons were exported to this country in 1869, and 472,403 tons in 1870.

The production of pig iron in Great Britain is far ahead of that of any other country, being hardly less this year than 6,000,000 tons, or about treble that of this country. Yet it was but 180,000 tons in 1800, and had barely more than doubled twenty years afterward, when it reached 368,000 tons. Ten years later, it had not doubled again, being (in 1830) 678,417 tons; but about that time railroads were devised, and the British iron product again doubled in less than ten years, being 1,500,000 tons in 1840. Five years later, it stood very nearly the same; but in 1850, it had increased to 2,250,000 tons. In 1863 it had again doubled, being 4,510,000 tons. In 1869 (our latest full return), it was 5,445,757 tons.

France made 114,000 tons of iron in 1818, 750,000 tons in 1855, and 1,380,000 tons in 1869.

Prussia made 804,052 tons in 1866, against 400,000 tons in 1860.

Belgium made 319,943 tons in 1860, and 863,000 tons in 1869.

[NOTE.—These statistics of European production are given in tons of 2,240 lbs.]

We had hoped to include in this exhibit a view of the distribution of iron making throughout the Union, showing how steadily this industry is diffusing itself over the country; but we are disappointed. We know generally that the production of pig iron in Missouri is already considerable, and rapidly increasing; we know that it has recently been commenced, under highly favorable auspices, in Indiana; we know that Tennessee, Wisconsin, old Virginia, North Carolina, and even Alabama, are successfully smelting their own ores into good pig iron, mainly by aid of charcoal; but our returns from these States are provokingly meagre and inexact. May we not hope that they will not long remain so?

The production of our rolling shows a steady annual increase during the last seven years. Here are the figures:

Years.	Rails.	Other than rails.	Total annual product.
1864	335,369	536,958	872,327
1865	356,292	500,048	856,340
1866	430,778	595,311	1,026,089
1867	462,108	579,838	1,041,946
1868	506,714	598,286	1,105,000
1869	593,420	642,420	1,236,006
1870	620,000	710,000	1,330,000

Of the diverse kinds of iron produced by our rolling mills, we have nothing like full returns later than 1866, when this country produced (of other than railroad) 595,311 tons of rolled or hammered iron, returned as follows:

	Tons.		Tons.
Bar and rod	276,192	Sheet	33,969
Nails and spikes	197,625	Hoop	16,459
Plate	71,507	Axle and other	49,559

This production was locally distributed as follows:

	Tons.		Tons.
All New England	87,571	Maryland	23,602
New York	70,197	West Virginia	24,395
New Jersey	48,616	Ohio	76,052
Pennsylvania	243,921	All others	20,955

For the facts embodied in the above exhibit, we are indebted to the American Iron and Steel Association, through H. S. MCALISTER, Secretary.

The Gulf Stream.

Dr. HAYES has contributed an article to the *Galaxy* for January, which goes to show that many of the speculations and assertions which have become so popular, regarding the Gulf Stream, are incorrect or exaggerated. He says that the precise limits of the Gulf Stream are yet to be determined. Wherever the particular point of its beginning may be, however, it is pretty certainly ascertained that the stream itself is produced by a current of air formed from the northeast and southeast trade winds. This current "heaps up" the waters in the Gulf of Mexico, to use Franklin's phrase, and because it comes from tropical regions, warms them. A current of water, of warmer temperature than the average temperature of the waters of the Gulf of Mexico, is thus formed. This current flows eastward and northward along the coast of North America under the continued influence of the wind. Its rate of speed diminishes as the power of the wind diminishes, and its temperature lowers, though less rapidly, as its waters mingle with the colder waters below and on either side of it.

The point where the Gulf Stream ends, is as uncertain as the point where it begins. It is popularly supposed to divide at the northern point, one branch running north into the Arctic Ocean, and the other going eastward toward the coast of Europe. There are no facts known, however, to sustain this belief. Whatever currents of water may flow in these directions can be accounted for by the force of the winds which prevail in those parts. It is thought that the Gulf Stream disappears at the northern point in the waters of the surrounding ocean, gradually losing its peculiarities in its northward course.

As to the effects produced upon the climate of North America by the gulf stream, Dr. HAYES denies that there is a single fact to show that it exerts any influence at all. Its current is to the waters of the Atlantic Ocean as a tiny rivulet is to the broad acres through which it finds its way, and the effects produced in the two cases are about alike. At Newport, for example, whose delicious climate is popularly thought to be due to the benign influence of the Gulf Stream, its waters are one hundred and fifty miles distant, while the prevalent winds are westerly, and how temperature can "beat to windward" for that distance is a question not yet satisfactorily answered. The fact appears to be that air, when unconfined, receives no perceptible accession of heat from water. Numerous experiments have been made, confirmatory of this proposition, and a negative proof is found in the slight influence produced upon the temperature by the presence of icebergs. The mild climate of Norway and the British Isles is produced by currents of air laden with warmth and moisture, and not by the influence of the Gulf Stream.

THE COAL TRADE.

Anthracite Coals.

NEW YORK, Jan. 5, 1872.

WHOLESALE.—The suspension of work on the part of the miners of the Wilkesbarre Coal and Iron Company, on account of the reduction made by the Company in their wages, is almost the only news which creates any excitement whatever among the coal traders of our city. This company only sought to have their work done at the same rates that other companies are paying. They were among the very first to make terms with their men during the great strike of last winter, and the other companies, which held out longer, made a somewhat more favorable arrangement. At present prices, we imagine the stoppage will be but very slightly injurious to the company, though, if of long continuance, it may be a more serious matter for the men. The general opinion seems to be that the men will soon see the impossibility of the company's acceding to their demands, and resume work. This would certainly be the most sensible course for them to pursue, and unless they are influenced by demagogues, we have no doubt that they will soon adopt it. It has been estimated that the strike last year cost Schuylkill county alone about three millions of dollars for labor, and in other regions the loss was doubtless proportionally great. As all this money came directly from the pockets of the working classes, there can be no doubt that they are ill-prepared to repeat the experiment. The Wilkesbarre people continued to pay the high rate of wages as long as they could, and it seems but fair that they should now be put on the same footing with others. The men in the employ of Mr. J. H. SWOYER have, we learn, also stopped, so that Wilkesbarre must present quite a dull appearance.

In consequence of the suspension, the circular fixing the prices of the Wilkesbarre Company's coal of January has not been issued.

The prices of Lackawanna coal to contractors at Weehawken have been reduced from our last quoted rates to $4 for lump; $4 25 for steamboat; $4 40 for broken; $4 50 for egg; $5 25 for stove, and $4 25 for chestnut.

The prices of Lehigh coal given by various dealers are not different from those fixed at the meeting of the Lehigh Coal Exchange, which we gave last week.

The following will explain itself:

PENNSYLVANIA COAL COMPANY.

TRINITY BUILDING, 111 BROADWAY,

NEW YORK, Jan. 1, 1872.

Present prices for Pittston coal, to be delivered at Weehawken pier, subject to the usual conditions of sale and shipment. The company reserves the right to advance prices at any time, except upon purchases made prior to such advance. Orders sent in will not bind the company until accepted.

	Delivered at Weehawken.
Lump per ton of 2,240 lbs	$4 60
Steamer " "	4 60
Grate " "	4 80
Egg " "	4 90
Stove " "	5 20
Chestnut " "	4 60

Fifty cents per ton additional for delivery in Company's boats at other points about the harbor of New York.

The above prices are for cash.

GEO. A. HOYT, Treasurer.

A change will be noticed in the tolls from Mauch Chunk to tide water, in conformity with the following circular:

CENTRAL RAILROAD COMPANY OF NEW JERSEY.

GENERAL OFFICE, 119 LIBERTY STREET,

NEW YORK, Jan. 1st, 1872.

Notice to Coal Shippers.

No. 20.

From this date until further notice the following tolls per ton will be charged by this company on coal shipments from Penn Haven, Mauch Chunk and Philipsburg to the several tide points named:

To Mauch Chunk	$0 12	.....	.....
To Phillipsburg	84	$0 72	.....
To Elizabethport	1 90	1 78	$1 06
To Port Johnston	1 90	1 78	1 06
To Newark	2 26	2 14	1 42
To Hoboken	1 90	1 78	1 06

The rate on coal for way points on the New Jersey Railroads will be $1 15 per ton from Mauch Chunk to Phillipsburg.

The above tolls do not include Wharfage or Shipping expenses at tide ports.

SAM'L KNOX, Secretary. R. E. RICKER, Supt. and Eng'r.

A reduction will be noticed in the prices of Wilkesbarre lump, grate, egg, stove and chestnut, and an advance in steamboat coal at Hoboken.

RETAIL.—The Delaware and Hudson Canal Company offer Lackawanna coal in their yard, at retail, at the following rates: grate, $4 75; egg, $5; stove, $5 25; chestnut, $4 75. At these rates, it will be seen, but little margin is left for profit to those who buy at circular rates and sell to retail dealers. The middlemen must be having an exceedingly dull time of it.

BITUMINOUS COALS.—There is no change to note in the standing of these coals in the market or in the prices which they command. Although but small amounts are now coming to market, the Consolidation and other Cumberland coal companies have a good stock on hand which is held firmly at our last quotations. Picked lumps of the coal of the Consolidation Company, for domestic use, bring $10 per ton at retail, and as they give about as pleasant a fire as English cannel which is now sold, we believe, for $28 per ton at retail, the price does not seem extravagant.

Anthracite Coal Trade for 1870 and 1871.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending Dec. 30, 1871, compared with the week ending Dec. 31, 1870.

COMPANIES.	1870. WEEK.	1870. TOTAL.	1871. WEEK.	1871. TOTAL.
*Phila & Reading R.R†	....	2,984,263	....	3,689,436
*Schuylkill Canal	....	660,665	....	1,010,171
*Lehigh Valley R. R.	....	2,810,020	....	2,210.272
Lehigh & Sus. R. R.	29,162	1,095,050	30,311	1,331,055
Lehigh Canal	....	761,239	....	740,636
Scranton North	1,809	669,843	10,938	556,115
" South	396	1,678,258	36,628	1,348,806
Penn. Coal Co., rail	109	1,069,405	18,467	787,116
" " " canal	....	16,603	....	13,962
Del. & Hud. Canal Co.	....	1,292,675	....	991,825
" " East	9,192	456,924	9 734	352,043
" " West	3,042	89,758	1,213	114,763
South	7,006	66 ,501	4,2.9	335,847
Shamokin	1,918	486,174	6,013	628,866
Treverton	....	67,571	....	....
Lykens Valley Coal Co.	....	67,774	566	94,458
Wyoming South	....	326,645	....	....
Wyoming North	....	....	....	4,167
P. N. Y. C. & R. R. Co.	....	276,151	....	104,987
Williamstown Co'y	2,526	296,423	....	....
Big Lack Col	....	88,890	901	147,649
Total	55,160	15,544,722	119,031	14,432,174
1870		14,432,174	55,160	
Decrease		1,112,548		
Increase				63,570

* These figures are for the week and fiscal period ending Nov. 30. See tables below for tonnage since Dec. 1.

† Less coal transported for Co's use and Bituminous coal.

Bituminous Coal Trade, 1870 and 1871.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Dec. 30, 1871, compared with week ending Dec. 31, 1870.

COMPANIES.	1870. Week.	1870. Year.	1871. Week.	1871. Year.
C. & O. Canal	....	520,197	....	653,420
B. & O. R. R.	11,886	894,185	17,617	1,231,221
H. & B. T. R. R.	5,752	313,921	4,781	319.845
*Harrisburg & D	....	680,791	....	742,424
*L. V. R. R.	....	13,847	....	355,096
P. & N.Y.C. & R. Co.	....	239,660	....	....
Cumberl'd Branch Canal	....	84 238	....	194,253
" Railroad	1,596	114.107	302	71,491
Total	19,234	2 860,946	22,700	3,567,750
			19,234	2,860,946
Decrease				
Increase			3,466	706,804

The tonnage of the P. & N. Y. C. & R. R. Co. is included in that of the L. V. R..R. Co.

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending Dec. 30—Compared with same time last year.

WHERE SHIPPED FROM	WEEK 1871., tons ct	WEEK 1870. tons ct.	YEAR 1871 tons cwt.	YEAR 1870, tons. cwt
Wyoming Region	18948 05	16532 14	1297560 14	1247863 06
Upper Lehigh Region	3887 03	3481 01	111758 07	157531 11
Beaver Meadow Region				
Hazleton Region	46 13	242 00	217116 19	319323 18
Mahanoy Region				
Tresckow Region	1799 17		83665 10	
Mauch Chunk Region	9023 10	17415 16	247192 12	158428 18
Totals	33711 08	30721 11	1957290 02	1883398 13
Increase	2989 17		74205 09	
Decrease				
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	30311 06	29161 14	1331054 17	1095050 05
Forwarded East of Mch Chunk by Canal			420246 13	529036 09
Delivered at and above Mauch Chunk	1579 05	1116 12	7090 06	49425 01
Delivered to L. & B. R. R.at Plymouth Bridge	1458 04		105975 02	184286 17
L. V. R. R at Packer'n	362 13	443 05	29966 04	25310 01
Totals	33711 08	30721 11	1957294 02	1883008 13
Of the above there was transported on acc'nt of L. C. & I. Co	9775 12	10970 03	358244 11	214797 18
W.-B. C. & I. Co	13133 11	1888 03	868128 17	646091 13
Totals	22909 03	24858 06	1226373 08	860889 07
Increase			364963 11	
Decrease	1949 03			

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, December 30, 1871.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons.	Cwt.
From St. Clair	22,769	10
" Port Carbon	2,611	03
" Pottsville	173	09
" Schuylkill Haven	1,173	16
" Pine Grove	253	00
" Tamaqua	5,834	11
" Harrisburg		
" Dauphin		
Total	33,421	09

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	.....	
" Mill Creek "	.....	
" Schuylkill Valley Scales	.....	
" Mt. Carbon "	.....	
" Cressona "	21	17
" Pine Grove "	.....	
" Tamaqua "	.....	
Total	21	17

SHIPPED WESTWARD VIA NORTHERN CENTRAL RAILROAD.

Passing Locust Gap	273	18
" Shamokin	3,109	07
" Herndon	.....	
Total	3,383	05

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	84	08
" Lebanon & Pine Grove Branch	73	18
Total	158	0

CONSUMED ON LATERALS.

From Frackville Scales	671	16
" Mill Creek "	594	16
" Schuylkill Valley Scales	14	08
" Mt. Carbon "	308	06
" Cressona "	234	09
" Pine Grove "	96	00
" Tamaqua "	243	06
Total	2,170	01

LEHIGH AND WYOMING COAL.

Received via Allentown, E. Penn'a R.	370	13
" " Alburtis, " "	.....	
" " Oreland, G. & N. Br.	628	12
" " Connecting R. R.	.....	
" " Willow Street R. R.	143	13
Total	1,142	18

BITUMINOUS.

From Harrisburg	6,293	05
" Connecting R. R., G. & N. Br.	.....	
" Junction R. R.	142	19
Total	6,436	04

COAL FOR COMPANY'S USE.

Anthracite	6,557	16
Bituminous	297	07
Total	6,855	03

RECAPITULATION

	Total for Week.	Cor. week last year.	Increase & Decrease.
Passing over Main Line and Leb. Val. Branch	33,421 09	51,544 00	d 18,122 11
For Shipment by Canal	21 17	11 16	i 10 01
Shipped Westward via Northern Central R. R.	3,383 05	5,022 18	d 1,639 13
Shipped West or South from Pine Grove	158 05	4 10	i 153 16
Consumed on Laterals	2,170 01	3,218 08	d 1,048 07
Lehigh and Wyoming Coal	1,140 18	1,444 09	d 303 11
Total Anthracite paying fr'gt	40,295 16	61,246 01	d 20,950 05
Bituminous	6,433 04	6,708 03	d 271 19
Total of all kinds paying fr'gt	46,732 00	67,954 04	d 21,222 04
Coal for Company's use	6,855 03	3,282 06	i 3,594 17
Total Tonnage for Week	53,587 03	71,216 10	d 17,629 07
Previously this year	299,577 19	347,685 08	d 48,107 09
Total to date	353,165 02	418,901 18	d 65,736 16
SHIPPED BY CANAL.			
From Schuylkill Haven	396 02		i 396 05
" Port Clinton			
Total Tonnage per Week	396 05		i 396 05
Previous this year	12,959 11	36,225 17	d 23,266 06
Total to date	13,355 16	36,225 17	d 22,870 01

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending Dec. 30, 1871.

	1871. WEEK.	1871. YEAR.	1870. WEEK.	1870. YEAR.
By Railway	18,466 16	787,116 06	109 06	1,069,405 02
" Canal	.....	13,962 14		16,602 18
Total	18,466 16	801,078 10	109 06	1,086,008 00
Decrease 1871,	284,929 10			

Schuylkill Canal.

Report of coal transported over the Schuylkill Canal for the week ending Saturday, Dec. 30, 1871.

	Tons.	Cwt.
From Port Carbon		
" Pottsville		
" Schuylkill Haven	396	05
" Port Clinton		
Total for week	396	05
Previously this year	12,959	11
Total	13,355	16
To same time last year	36,225	17

Huntington and Broad Top R. R. Co.

For week ending Dec. 30, 1871	4,731 tons.
Same time last year	5,752 "
Increase	....
Decrease	971 "
Total amount shipped to date	319,845 "
Same time last year	313,921 "
Increase	5,924 "
Decrease	

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending Dec. 30, 1871, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	11,172 16	55,967 19
" Hazleton	25,445 12	136,513 16
" Upper Lehigh		264 01
" Beaver Meadow	9,683 08	54,379 14
" Mahanoy	4,113 19	23,686 02
" Mauch Chunk	27 01	313 04
" Sullivan & Erie	821 15	4,157 16
Total Anthracite	51,264 11	275,282 12
Bituminous Coal via P. & N. Y. R. R.	4,821 10	18,211 16
Bituminous Coal from all sources	883 00	883 00
Total by rail and canal	56,969 01	294,377 08
Same time last year	53,519 11	294,494 07
Increase	3,449 10	116 19
Decrease		
Forwarded East from Mauch Chunk by rail	44,178 19	234,075 12
Same time last year	45 174 03	252,605 08
Increase		
Decrease	995 04	18,529 16

RECAPITULATION.

Forwarded East from Mauch Chunk by rail	44,178 19	234,075 12
Forwarded North from L. & B. Junction.		
To N. C. R. R., at Mount Carmel	5,989 13	27,947 10
To L. & S. R. R. at Packerton for rail	63 13	73 06
Delivered at M'h Chunk	17 17	959 17
Delivered on line of road above Mauch Chunk	347 19	239 12 2,619 15
Delivered above Mauch Chunk for use of L. V. R.R.	666 10	4,987 14
To L. & S. R. R., at Penn Hav., for railroad		3,498 12
Do. for canal		864 07
At M. Chunk for canal		99 07
Total Anthracite	51,264 11	275,282 12
Bituminous Coal	5,704 10	19,094 16
Total all kinds	56,969 01	294,377 08

This report includes all Bituminous Coal carried over the Lehigh Valley and P. & N. Y. Railroads from December 1st 1870 to date.

Delaware and Hudson Canal Company.

The following is a statement of Coal Transpo ted by the Delaware and Hudson Canal Co. for the week ending Dec. 30, 1871.

	FOR THE WEEK.	FOR THE SEASON.
By Delaware and Hudson Canal,		991,825
By Railroad, East	9,734	352,043
" " West	1,213	114,763
" " South	4,259	335,847
Total Tons	15,206	1,794,478

For the same period last year.

	FOR THE WEEK.	FOR THE SEASON.
By Delaware and Hudson Canal,		1,292,675
By Railroad, East,	9,192	456,924
" " West	3,042	89,788
" " South	7,006	430,561
Total Tons	19,240	2,269,948
Decrease	475,470	

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, Dec. 30, 1871.

	WEEK.	SEASON.
North	48,446 03	1,675,486 02
South	4,258 17	335,847 04
Total 1871	52,705 00	2,011,333 06
Corresponding time in 1870:		
North	2,621 10	1,934,111 08
South	7,006 03	430,561 16
Total	9,627 13	2,364,673 04
Increase North	45,824 13	
Decrease North		258,625 06
Increase South		
Decrease South	2,747 06	94,714 12
Total increase 1871	43,077 07	
Total increase 1871		253,339 18

Lehigh Coal and Navigation Company,

Report of Coal transported over the Lehigh Canal and L. & S. Div. of Central Railroad of New Jersey for the week ending Dec. 30, 1871, and for the year 1871.

	WEEK.	YEAR.
Forwarded East of Mauch Chunk by Rail	30,311	1,331,054
Delivered at and above do.,	1,579	70,901
Forwarded East of do., by Canal		740,636
	31,890	2,142,592
Corresponding period last year—		
Forwarded East of Mauch Chunk by Rail	29,161	1,095,050
Delivered at and above do.,	1,116	49,425
Forwarded East of do., by Canal		789,111
	30,278	1,933,586
Increase on Railroad	1,612	257,480
Decrease " "		
Increase on Canal		
Decrease " "		48,475
‡ above there was transported on account of—		
Lehigh Coal Nav. Co	9,775	621,023
Wilkesbarre Coal & Iron Co	13,133	868,128
	22,909	1,489,152
Corresponding period last year—		
Lehigh Coal Nav. Co	10,970	325,467
Wilkesbarre Coal & Iron Co	13,888	646,591
	24,858	972,059
Increase		517,093
Decrease	1,949	

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna and Western R. R. for week ending Dec. 30, 1871.

	Week. Tons. Cwt.	Year. Tons. Cwt.
Shipped North	10,937 12	556,115 0
Shipped South	36,628 04	1,348,805 11
Total	47,565 16	1,904,920 16
For the corresponding time last year:		
Shipped North	1,808 17	669,843 04
Shipped South	395 15	1,678,258 04
Total	2,204 12	2,348,101 08
Increase	45,361 04	
Decrease		443,180 12

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday Dec. 30, and during the year 1871, compared with the corresponding period of 1870.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To B. & O. R. R. Co Tons. Cwt.	Total. Tons. Cwt.
1871	.....	17,617 00	17,617 00
1870	.....	11,886 13	11,886 13
Increase		5,730 07	5730 07
Decrease			

YEAR.

1871	653,400 02	1,231,221 00	1,884,641 02
1870	520,196 16	894,184 11	1,414,381 07
Increase	133,223 06	337,036 09	470,259 15
Decrease			

Cumberland Branch

WEEK.

	To C. & O. Canal Tons. Cwt.	To B. & O. R. R. C. Tons. Cwt	Total. Tons Cwt.
1871	.....	302 05	302 05
1870	.....	1,594 15	1,594 15
Increase		1,292 10	1,292 10
Decrease	.....		

YEAR.

1871	194,253 07	71,490 16	265,744 03
1870	84,238 05	114,106 17	198,345 02
Increase	110,015 02		67,399 01
Decrease		42,616 01	

Northern Central Railway,

SHAMOKIN DIVISION.

Below is the return of Coal sent over the Shamokin Division of the N. C. R. W., for the week ending Dec. 30, 1871.

	Tons. Cwt.
East	
West	6,012 14
Same time last year	1,918 05
Increase	4,094 09
Decrease	
Total amount shipped to date, 1871	628,866 02
Same time last year, 1870	486,174 05
Increase	142,691 16
Decrease	

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK, Jan. 7. R. A.	W. A.	AT PHILADELPHIA. Jan. 6. R. A.	W. A.
SCHUYLKILL.				
Lump	$ —	$ —	— —	— —
Steamer	4 50	— —	— —	4 50
Broken	4 50	— —	— —	— —
Egg	— —	— —	5 00	4 75
Stove	5 00	— —	5 00	5 00
Chestnut	4 25	— —	— —	— —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	5 00	— —	— —	— —
Broken	4 75	— —	— —	— —
Egg	4 50	— —	— —	— —
Stove	5 25	— —	— —	— —
Chestnut	4 25	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Honey Brook, Le'h W. A.	4 50@5 25		— —	— —
Spring Mountain " "	— —@— —		— —	— —
Sugar Creek " "	— —@— —		— —	— —
Sugar Loaf " "	— —@— —		— —	— —
Old Comp'y's. " "	4 25@5 25		— —	— —
Cross Creek " "	— —@— —		— —	— —
Room Run " "	4 25@5 25		— —	— —
Girardville " "		— —	— —	— —
McMichael " "		— —	— —	— —
Shamokin " "		— —	— —	— —
Lykens Valley " "		6 00	— —	— —
Broad Top " "		— —	— —	— —
Hill & Harris " "		— —	— —	— —
Henry Clay " "		— —	— —	— —
Powelton "		— —	— —	— —

*Dealers in these coals may be found in our advertising columns.

Company Coals.

Jan. 1872.

	L.	Str.	Gra.	Eg.	Sto	Chest
*Scranton at E. Port	3 45	4 00	4 00	4 15	5 00	4 05
*Pittston at Weehawken	4 60	4 60	4 80	4 90	5 20	4 60
*Lackawana at Weehawken	4 20	4 30	4 50	4 75	5 00	4 50
Wilk'b're at Hoboken	4 10	4 25	4 40	4 50	5 25	4 25
Old Co. Lehigh at Pt. John'n	5 00	—	4 75	4 50	5 25	4 25
Lehigh at Eliz. Port	5 00	—	4 75	4 50	5 25	4 25

For freights to different points see "Freights."

* To contractors.

Line Prices for Coal Dec, 1871,

	Lump	Broken	Egg	Stove	Chest
At Mauch Chunk	4.00	4.00	4 00	4.25	3.00
" Wilkesbarre	3 75	3.75	3.75	4.00	3.00

Prices at Baltimore—Dec., 1871.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 60@5 85
Pittston and Plymouth, do	— —@5 60
Shamokin Red or White Ash, do	— —@5 60
Lykens Valley Red Ash, do	— —@6 30
Zerbe Valley	— —@— —
Trevorton	— —@— —
By retail, all kinds per ton of 2240 lbs	7 00@8 25
Georges Creek & Cumberland f. o. b. at Locust Point for cargoes	4 50@4 75
Fairmont and Clarksburg gas, f. c. b. at L. Point	6 00@6 50

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein	L.o.b. at Phila	$ —
Lemon "	" "	—
Cumberland Vein Coal		—
Consolidation Coal Co.'s on board	N. Y.	7 50
Maryland Coal Co.	" "	7 50

Prices at Georget'n, D.C., & Alexandria, Va.

Jan. 1872.

George's Creek and Cumberland f. o. b. for shipping $4 50

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$5 25@5 50
Lykens Valley	6 25@6 50
Shamokin Red or White Ash	5 50@5 75
Trevorton and Zerba Valley	— —@— —

Prices of Gas Coals.

Jan, 1872.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N. Y

Duty, $1 25, gold

	Coarse	Slack.
Block House	$1 75	@1 75
Gowrie	1 75	@1 75

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coa
Picton	$2 25	@1 25
Sydney	2 25	@— 80
Lingan	1 60	@— 80
Little Glace Bay	1 60	@1 00
Caledonia	1 60	@— 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal

AMERICAN.

	Currency.
Westmoreland	$7 00 @— —
Fairmount Gas Coal Co. of N. Y.	7 00 @— —
Despard Coal Co	7 00 @— —
Penn	7 00 @— —
Newburg Orrel Gas	— — @— —
West Fairmount Gas Coal	7 00 @— —

AT PHILADELPHIA.

Powelton	$6 75

TO NEW YORK.

Provincial.	
Sidney	$3 25
Lingan	3 25
Cow Bay	3 37½
Port Caledonia	3 37½
Little Glace Bay	3 25

Prices of Foreign Coals.

Jan, 1872,

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street, N. Y.

Liverpool Gas Caking	$ 8 00@— —
" " Cannel	12 00@13 00
" House "	18 00@20 00
" Orrel	14 00@16 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" Cannel, "	18 00@20 00

Per ton 2,000 lbs. delivered.

Freights.—Jan. 1872.

TO EASTERN PORTS.	Cumberland. From Georgetown.	Cumberland. From Baltimore.	Anthracite. From Philadelphia.	Anthracite. From Elizabeth Port, Port Johnston, and Hoboken.	Anthracite. From Newburg.	Anthracite. From Rondout.
Amesbury						
Bangor						
Bath						
Boston		4 00		3 00		
Bridgeport		2 30		1 10		
Bristol						
Cambridgeport						
Derby						
Dighton						
East Cambridge						
Fall River		3 50		1 80		
Hackensack						
Hartford						
Jersey City				55		
Middletown						
Mystic						
New Bedford		3 50				
Newburyport						
New Haven		3 50		1 10		
New London		3 25	3 50	1 25		
Newport				1 40		
New York		2 50		55		
Norwalk				1 10		
Norwich				1 50		
Pawtucket				1 00		
Portland		4 00				
Portsmouth, N.H						
Providence		3 50				
Rockport						
Saco						
Sag Harbor						
Salem				1 20		
Stamford						
Stonington				1 10		
Taunton				1 25		
Warren						
Washington						
TO RIVER PORTS.						
Albany						
Catskill						
Cocksackie						
Coeyman's						
Cold Spring						
Fishkill						
Haverstraw						
Hudson						
New York						
Nyack						
Poughkeepsie						
Rhinebeck						
Rondout						
Saugerties						
Sing Sing						
Stuyvesant						
Tarrytown						
Troy						
West Point						
Yonkers						

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven for consumption	$2 19
For reshipment	2 00

MAUCH CHUNK TO ELIZABETHPORT.	
L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 72
C. R.R., N. J., Phillipsburgh to Elizabethport	1 06
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$2 13

MAUCH CHUNK TO PORT JOHNSON.	
L. V. R.R., or L. & S. R.R. from M. C. to Phillipsb'g	$0 72
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	1 06
Shipping expenses	25
Wharfage	10
Total	$2 13

TO HOBOKEN.	
L. V. R. R., Mauch Chunk to Phillipsburgh	$ 72
Morris & Essex R. R. Phillipsburgh to Hoboken,	1 06
Shipping expenses	25
Wharfage	10
Total	$2 13

TO SOUTH AMBOY.	
L. V. R. R.	72
B. & D. R. R. / Cam. & Am. R. R.	91
Shipping Expenses	35
Total	$1 08

PENN HAVEN TO ELIZABETHPORT.	
L. V. R R. Penn Haven to Phillipsburgh	88
C. RR. of N. J. Phillipsburgh to Elizabethport	1 06
Shipping expenses	25
Wharfage	10
Total	$ 2 29

MARKET REVIEW.

FOR THE WEEK ENDING JANUARY 6th 1872.

IRON—The market remains very quiet for both Scotch and American Pig, but prices are nominally as before noted—we have only to notice a sale of 100 tons Eglinton at $33,50 from yard. There has been very little inquiry for either old or new Rails, but prices are steady at our quotations. Refined Bar from store continues very firm with an upward tendency—a meeting of dealers will be held to-day when some change is probable. Russia Sheet is nominal at 15½@16 cents gold. Galvanized Sheet is now uniform at 20 per cent. discount, as we announced in our last—400 bdls. sold on terms we did not learn. Best Charcoal Black Sheets, are quoted No. 12 to 24, 6 cents, and 25@27, 6½, cash.

Stock, January 1—	1869.	1870.	1871.	1872.
Scotch Pig ..... tons.	1,500	3,000	1,600	3,500

LEAD—Foreign Pig with strong markets abroad, is held with more firmness; 100 tons Spanish sold at 6 cents gold. Pipe and Sheet have been reduced to 10 cents (½ cent lower); Bar 9¼, as before, and Tin-lined Pipe 15, all 10 per cent discount to the Trade.

Stock in New York, January 1—

	1866.	1867.	1868.	1869.	1870.	1871.	1872.
Tons	1,500	2,000	3,600	1,500	1,250	600	3,000

COPPER—Manufactured is without change. Ingot continues in demand, and the advanced prices are well sustained. Sales have been made of 300,000 lb. Lake at 27¼ cents, cash, and 50,000 lb. for delivery 15th inst., 27½; for January, February and March, 28 cents is asked.

Estimated Stock of Ingot at this port, Jan. 1—

	1869.	1870.	1871.	1872.
Lake Superior	6,000,000	7,000.000	9,500,000	5,500,000
Balt., Tenn's'e, &c.	1,000,000	2,000,000	1,200,000	200,000

SPELTER—Is very firm; 15 tons Silesian sold at 7½ cents gold, domestic 11 c. currency.

TIN—Pig remains very quiet, and prices are still nominal. Straits is held at 38¼ cents, English 28, and Banca 42@43 all gold. Plates are very firm with considerable business, considering the holiday period. Sales have been made of 1000 bxs. Charcoal Tin, to arrive, at $9,37½ for I.C.; 500 do; I.C. Coke, 14 by 20, $8,45; and 1000 do. Charcoal Terne, to arrive, $8,37½, all gold.

A Liverpool paper of the 16th ult. says:—

FOREIGN COMPETITION IN TIN.—The news which has been received in Cornwall as to our great foreign competitors in Tin, and their apparent inability to put a greater supply in the market, is of course regarded as very satisfactory. It is believed that their utmost efforts will not succeed in making the next Banca sale in Holland a heavy one. For the 11 months to the end of November last, notwithstanding the temptation of unprecedented prices, from 1900 to 2000 tons of Tin less than in 1870 have been imported into Holland. For the same period, 1600 tons more than last year have been sought and obtained. There is reliable private information in Cornwall that Holland has at least 2700 tons of Tin in stock less to an this time 12 months. As a rule, the manufacturing districts slacken their demand for metals at this season of the year; but in anticipation of further advances, the demand is now remarkably brisk.

ZINC-Sheet is steady and quiet at former figures—we quote from store 10½@11½ cents, as to numbers, &c. Manganese black oxide 6¾ cents,

" " gray Pyrolusite 5½ "

We append the following *Metal Circular* of Messrs. VIVIAN, YOUNGER & BOND dated London, Dec. 15, 1871.

There has been a large amount of business in Metals during the week, and prices have advanced again for most descriptions.

Copper—An active demand has followed the late repeated advances in prices, and so far the increased values seem to tend (by drawing the attention of different interested parties to the real position of the article) to bring in large buyers from all sources. We have to report extensive transactions in Bar up to £83 cash, and £85 with three months' prompt. For Regulus 16s. 9d. has been paid to arrive in Liverpool. The smelters are getting a good demand for Raw Copper, and Fine Foreign has also been in request at advancing rates. We close with a very firm market, and at last it would appear that this article has really entered upon a certain time of prosperity after the depression and loss which all concerned in it have suffered from more or less during the last few years.

Tin—The high value of this metal has caused it to lose its interest just now when our other articles can be dealt in with so much greater safety, and with quite an equal chance of profit: and without the speculative element at work from day to day the price does not seem able to hold its own, notwithstanding the good statistical position, so we have had a dull and stupid market.

Tin Plates—The demand continues, and is indeed so large, that many makers are compelled to refuse orders altogether.

Iron—Prices are very firm, and there is plenty of work for all the makers at highly remunerative rates.

Spelter—As in Copper, the low price and absence of vitality in the article has caused it to be unduly neglected; and a considerable speculative movement having caught the consumers without stock, prices have risen considerably, and it does not appear improbable that we shall see values still much higher.

Lead—A demand for China in the first instance, and since a general improvement in the trade has caused an advance of nearly 20s. per ton. The market is firm at the close.

METALS.

NEW YORK, Jan 6, 1872.

IRON.—Duty: Bars, 1 to 1¼ cents ₩ lb; Railroad, 70 cents ₩ 100 lbs.; Boiler and Plate, 1½ cents ₩ lb; Sheet, Band, Hoop, and Scroll, 1¾ to 1¾ cents ₩ lb; Pig, $7 ₩ ton; Polished Sheet, 3 cts. ₩ lb; Galvanized 2½; Scrap Cast, $6; Wrought, $8 per ton.

	Store Prices
Pig, Scotch No. 1, ₩ ton	33 50@38 00
Pig, American, No. 1	36 00@— —
Pig, American, No. 2	34 00@35 00
Pig, American, Forge	33 00@34 00
Bar Refined, English and American	— —@86 00
Bar Swedes, assorted sizes (gold)	85 00@100 00
	Store Prices, Cash.
Bar, Swedes	107 50@120 00
Bar, Refined, ord'y sizes	90 00@ — —
Bar, Refined, 1¼ to 6 by ½ @ 5-16 inch	95 00@ — —
Bar, Refined, 1 & 1¼ by ¼ & 5-16	97 50@ — —
Bar, Refined, 2½ to 3 Round & Square	97 50@ — —
Scroll	107 50@137 50
Ovals and half-round	107 50@125 00
Band	— —@102 50
Horse Shoe	105 00@115 00
Rods, ⅜ to 3-16 inch	95 00@130 00
Hoop	112 50@160 00
Nail rod	6¾@ — —
Sheet, Russia, as to assortment (gold)	15½@ — 16
Sheet, Single, D, and T. Common	—5½@— 6
Sheet, D. and T. Charcoal	—6 @— 6½
Sheet, Galv'd, Nos. 14 to 26 ..... 2½ to 30 ct. dis.	12@14c lb.
" " Nos. 27, 28, and 29 ..... 20 to 30 ct. dis.	15@18c lb.
Rails, English (gold), ₩ ton	57 00 @59 00
Rails, American, at Works in Pa	70 00 @71 00

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ₩ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₩ lb	— @— 34
Copper Bolts	— @— 36
Copper Braziers, 16oz. and over	— @— 36
Copper Nails	— @— 40
Copper, Old Sheathing, &c. mixed lots	25½@— 26
Copper, Old, for chemical purposes, 14@16 oz	— @— —
Copper, American Ingot	27¼@— 27½
Yellow Metal, New Sheathing & Bronze	— @— 24
Yellow Metal Bolts	26 @— —
Yellow Metal Nails	— @— 24

LEAD.—Duty: Pig, $2 ₩ 100 lbs.; old Lead, 1½ cents ₩ lb; Pipe and Sheet, 2½ cents ₩ lb.

Galena, ₩ 100 lbs	$— —	@— —
Spanish (gold)	5 80	@6 00
German, do.	5 80	@5 90
English do.	5 90	@6 25
Bar (net)	9 25	@ —
Pipe (net)	— —	@10 00
Sheet	— —	@10 00

Colwell, Shaw & Willard Tin-Lined Lead Pipe 15 cts. ₩ lb.

STEEL.—Duty: Bars and ingots, valued at 7 cents ₩ lb or under, 2¼ cents; over 7 cents and not above 11, 3 cents ₩ lb; over 11 cents, 3½ cents ₩ lb, and 10 ₩ cent ad val. (Store prices.

English Cast (2d and 1st quality) ₩ lb	— 15	@— 18
English Spring (2d and 1st quality)	— 7	@— 10
English Blister (2d and 1st quality)	— 10	@— 17
English Machinery	— 11	@— 13
English German (2d and 1st quality)	— 10½	@— 12
American Blister "Black Diamond"	— —	@— 12
American, Cast, Tool do.	— 15	@— 16
American, Spring, do.	— 9	@— 11
American Machinery, do.	— 9	@— 10
American German, do.	— 9	@— 11

TIN.—Duty: Pig, Bars, and Blocks, 15 ₩ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₩ cent.; Roofing 25. ad val.

	Gold ₩ lb.
Banca	42½@43
Straits	38½@—
English	37½@38

PLATES.

Fair to Good Brands.	Gold.	Currency.
I. C. Charcoal, ₩ box	$9 50 @9 62½	$10 25 @11 00
I. C. Coke	8 25 @9 00	9 25 @10 25
Coke Terne	7 25 @8 00	8 00 @ 9 25
Charcoal Terne	8 37½@8 50	9 50 @10 25

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100 lb

Plates, Foreign (gold) p. 100 lb.	7 00	@ 7 50
Plates, Domestic p. lb.	— 7	@— 11

ZINC.—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c. per lb

Sheet per lb.	— 10½@—11½

We give below a comparative statement of the imports of the leading metals at this port for the last four years:

	1868.	1869.	1870.	1871.
Copper	$43,382	$106,355	$35,077	$23,406
Iron bars	2,558,712	2,901,776	2,920,501	3,970,193
Iron pig	501,704	952,627	893,968	1,593,758
Iron RR	4,094,569	6,346,917	6,861,743	10,118,972
Iron sheet	350,443	358,638	208,703	261,182
Lead	2,286,213	2,985,890	3,014,358	2,940,583
Spelter	338,146	501,436	369,664	366,867
Steel	3,382,146	2,342,918	2,216,410	2,612,258
Tin and tin plates	6,028,759	7,559,576	7,535,109	8,587,042
Zinc	187,511	422,967	331,845	245,765

San Francisco Stock Market.

BY TELEGRAPH.

Our report from the San Francisco Stock Board is dated the 2d inst; the list has not materially changed compared with our last, but on the whole the market evinces a firmer feeling, Belcher has advanced still more being quoted at $450—Crown Point is only $10 behind, the report quoting it at $440—Opir is appended to the list as selling at 32,50, The following is the report in full.

Savage	46½
Yellow Jacket	60½
Kentuck	150
Chollar Potosi	33½
Gould & Curry	111
Belcher	450
Crown Point	440
Ophir	32½
Imperial	..
Amador	..
Eureka G. V.	..
Meadow Valley	..

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CHEMIST AND METALLURGIST,

209 South Sixth Street,

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STOVE LININGS AND FIRE CEMENTS.

Vitrified steam-pressed Drain and Sewer Pipe, and Manufacturers of Clay in general.

Baltimore Retort and Fire-Brick Works.

GEO. C. HICKS & CO.

Apr4:eow:1y Baltimore.

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IRON MINE,

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Two miles from canal, and quarter of a mile from railroad,

The Quality of the Ore is Unequalled,

being Free from Sulphur, &c.

A Steam Engine in perfect working order and miners' houses are now on the premises. The vein is thoroughly opened, shafts sunk, and Ore can be raised in large quantities immediately. Satisfactory reasons given for disposing of this property.

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CINCINNATI, O.

DEPARTMENT OF POPULAR SCIENCE.

The Lost Arts.

It is a favorite occupation of modern writers and speakers. to reconstruct from hints and fragments the society of antiquity, and to draw comparisons, now seriously favorable, now wittily unfavorable, to the present age. Nothing is more fascinating than such antithesis, especially when the glamour of ancient, half-fabulous days is thrown around the facts or fancies thus drawn from obscurity. Who has not listened to WENDELL PHILLIPS, the modern Chrysostom, "the golden-tongued," as he beguiled us into the belief that the men of old possessed the very knowledge on which we pride ourselves; that they had railroads and opera-glasses, and newspapers, and a host of devices and processes which are "Lost Arts" to us? A good many of these notable arts however, are somewhat apocryphal. The fresco-paintings in tombs and catacombs, and buried cities, which had endured for centuries in freshness of color, and which it was tauntingly told us we could not imitate, having lost the art, are found to be fading now, like anybody else's pictures, under the influence of ordinary sun and air. So the art of fresco (that is to say out-door) painting, lies, it seems, in not letting the work stay out-doors, but burying it while it is new. Then that wonderful cement of Rome, which this degenerate and ignorant age could not reproduce, turns out to have been, in the main, an indifferent kind of mortar. We read that buildings used to tumble down in Rome, just as they do in New York. In some cases, by a lucky mixture of materials or by care in building, or by reason of the massive character of palaces and temples that enabled them to stand, cement or no cement, the edifices of ancient and imperial Rome have endured to this day. So the art of making a perfect cement, as understood by the ancients, would seem to be reduced to this formula: If your building stands a thousand years, the cement will have time to set thoroughly, and may be pronounced inimitable!

So far as we know, the ancients were acquainted with only seven metals, copper, iron, gold, silver, lead, quicksilver and tin. Our list of known metals comprises more than fifty. Copper and its alloys were their favorite materials. The Egyptians and Romans (and likewise the Peruvians) had some process for hardening copper so as to make cutting tools of it; but this art is not "lost"; it is only thrown away, because we have in steel a cheaper and better material. Several hard alloys of copper are known—one in particular, of copper and phosphorus, which is hard enough for a knife-blade. Persons altogether ignorant of phosphorus, as such, might get this alloy by heating bone-dust, charcoal and copper together. Some varieties of brass (copper and zinc) and bronze, (copper and tin) are also tolerably hard. But it must be born in mind that it is not proved that the ancients made *good* tools, equal to ours. On the contrary, it is pretty clear that they had to make up for the imperfection of their instruments and mechanical appliances by expending a vast amount of manual labor and time. The individual described by Swift as grinding down a crowbar to make a needle cannot be said to have possessed the art of manufacturing needles.

Nearly a hundred years ago, the Göttingen Society of Sciences, influenced by the current notions about the superiority of the ancient arts, offered a prize for the best treatise on the question: "Was there anything in the arts of mining and metallurgy, as practiced among ancient nations, which is not now known, and which if known, would be valuable to those industries at present?"

The prize was won by JOHANN FRIEDRICH REITEMEIER, whose book, *Geschichte des Bergbaus und Hüttenwesens bei den alten Völkern* (History of Mining and Metallurgy among Ancient Nations) is an admirable compendium of antiquarian research on the subject. The only copy I know of in this country is in the Boston City Library. This author concluded that the moderns of his day could not learn anything of importance in the extraction of ores and manipulation of metals from their distant predecessors; and certainly we may be sure that the inprovements made in every art since 1785, the date of his book, have turned the scale still further in our favor.

But aside from all such mistaken eulogy of the past, there is an element of sophistry involved in making such comparisons at all. For the best criterion of advance is not merely the amount of knowledge existing in the world at any period. It is not merely what is known, but who knows it? how is it known? what use is made of it? Above all, it seems to me, we may say of later times, and especially of our own, that they show us, not merely progress in arts, but an art of progress. The school-boy gains nothing by being crammed with knowledge. His learning amounts to little, unless he has learned how to learn. As the scripture says, "With all thy getting, get understanding."

This is the peculiarity of modern progress; it is discipline, not daring; experiment, not blind empiricism: universal education, not individual genius; method, not accident; fruitful application of science, not superstitious wonder at it. In a word, the Ancients walked in darkness, though they stumbled upon many things; we walk in light, though we have not discovered all things. The "lost arts" are not worth hunting after. R. W. R.

Texas Correspondence.

AUSTIN, TEX., November 25, 1871.

To the Editor, Sir:—Having been constantly in the field for the last six months and owing to the irregularity of the Texas postal arrangements I have not received my Washington mail regularily, and consequently have seen but few numbers of your paper. I learned, however, from Dr. Bonzano, of New Orleans, that in one of your issues you notice my communication to the New York Liberal Club, in reference to the Llano County silver-lead ore. As this ore differs in composition from any of those in our Western territories, I have sent to-day by mail a sample for your inspection, hoping you will find it of sufficient interest to place with your collection. The ores occur in a field of granite and feldspar intersected by veins of quartz which are the ore carrying veins. Although the ore crops out at many places, judicious explorations by practical men are necessary to determine the value of this new mining region. The outcroppings of the ore are from 10 to 20 feet in length, and from 15 inches to 4 feet in width. Owing to the large amount of carbonate of lead contained in the ore the smelting will be extremely easy, and as all the materials for flux, fuel and building are in the immediate vicinity there is every reason to believe that this locality may prove to be one of the most important mining districts in the United States.

Very respectfully your obedient servant,

A. R. ROESSLER.

The United States Mint and Branches.

The deposits of bullion at the mint and branches for the fiscal year were as follows: Gold, $37,054,202.26; silver, $5,975,982.54; total deposits, $43,030,184.80. Deducting from this total the re-deposits, or bars made at one branch of the mint and re-deposited in another for coinage, the amount will be $39,137,404.13.

For the same period the coinage was as follows: Gold coin, number of pieces, 1,120,916; value, $12,302,473; unparted and fine gold bars, $13,101,089.42; silver coin, pieces, 3,664,792; value, $1,955,905.25; silver bars, $3,544,180.13; nickle, copper and bronze pieces, 11,672,750; value, $283,760; total number of pieces struck, 16,458,458; total value of coinage, $40,187,409.80.

The distribution of the bullion received and coined at the mint and branches was as follows:

Philadelphia.—At Philadelphia, gold deposited, $3,064,733.31; gold coined, $3,206,760; fine gold bars, $129,184.88; silver deposited and purchased, $1,557,892.50; silver coined, $1,156,255.25; silver bars, $143,647.75; nickle, copper and bronze coinage, value, $383,760; total deposits of gold and silver, $4,622,625.81; total coinage, $4,919,607.88; total number of pieces, 13,670,015.

San Francisco.—At the branch mint, San Francisco, the gold deposits were $25,521,650.56; gold coined, $24,241,006.23; silver deposited and purchased, $937,577.80; silver coined, $908,015.27; total deposits and purchases, $26,459,228.45; total coinage, $25,149,021.50; total number of pieces, 2,649,900.

New York.—The assay office of New York received during the year in gold bullion, $6,345,338,88; in silver bullion, including purchases, $2.171,120.36; total value received, $8,516,459.24; number of fine gold bars stamped, 9,769; value, $5,461,801-10; silver bars, 10,763; value, 1,269,501.75; total value gold and silver bars, stamped, $6,731,302.85.

Denver.—At the assay office, late branch mint, Denver, Colorado, the deposits for unparted bars were, gold, $1,104,147.10; silver, $18,561.63; total deposits, $1,122,108.73; an increase of deposits over the last year of $116,658.47. This is very gratifying, and encourages the belief that as the mineral resources of the district are developed, the business of this office will be correspondingly increased. It is now engaged, as last year, in melting, assaying, and stamping gold and silver bullion in unparted bars, bearing the government stamp of weight and fineness. The assay office, in the performance of its appropriate functions, fully meets all the demands of the mining interests of Colorado.

The Hoosac Tunnel.

This enterprise has received new importance by an offer of the Troy and Boston Railroad to purchase it after its completion. For many years this great work has created much discussion in the Legislature and among the newspapers, and it was with the utmost difficulty that the friends of the tunnel overcame the opposition to it. At last, however, the work seems to promise success, and the dream of Boston—a new direct railroad connection with the West—seems likely to become a reality. Several weeks ago Boston was excited by a report that the Troy and Boston Railroad had offered to pay the State a semi-annual rental of $120,000 for thirty years, with the provision that at the end of that time they should have the right to purchase the tunnel for $4,000,000. This would be about one-half the estimated cost of the work. It was immediately reported that Commodore VANDERBILT was "at the bottom of it," and the opposition to selling was universal. The offer to purchase at once established the value of the tunnel, and all opposition to the State policy in prosecuting the work has vanished. The later and more reasonable conclusion in relation to the offer of the Boston and Troy Railroad Company is that they desired to protect themselves against the larger monopolies. Their road runs from North Adams to Troy. If the New York Central Company, or any other wealthy corporation, should control the tunnel, it would ruin the trade of the Troy and Boston road, which is now merely local. The State officers refused to entertain the offer to purchase the tunnel, but it will be discussed in the Legislature The plan which appears to be the most popular is for the State to hold the tunnel; to consolidate the Fitchburg, Troy and Boston, and other lines inerested in it, and to control them.—*Evening Post.*

Propulsion by Compressed Air.

On Wednesday evening last a paper was read by Mr. JAMES A. WHITNEY, before the Society of Practical Engineers, concerning the transmission of freight and passengers through cities by means of compressed air. The paper gave a comprehensive review of what has already been done in this field, and concluded with the author's views regarding the applicability of some method of this nature in our city. Mr. GILBERT then explained his plan of apid transit, which consisted of elevated tubes in which cars may be propelled by creating a partial vacuum before them.

THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D.,
WILLARD P. WARD, M. E.
Editors.

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THE ENGINEERING AND MINING JOURNAL *is projected in the intent of furthering the best interests of the Engineering and Mining public, by giving wide circulation to original special contributions from the pens of the ablest men in the professions. The careful illustration of new machinery and engineering structures, together with a summary of mining news and market reports, will form a prominent feature of the publication.*

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The Inhabitants of the Sea.

In another column will be found a letter from Professor AGASSIZ, whose sailing on the U. S. steamer Hassler, some weeks ago, was duly recorded in our journal. From this communication it will be seen that interesting facts have been observed already, and we may, from this initial success, feel confirmed in our sanguine expectations as to the final result.

The most interesting discovery so far made was that of a fishes nest, containing numerous eggs, in a bundle of gulf weed; the hatching of a number of the embryos and the subsequent identification, in a very remarkable manner, of the species to which the fish belonged which thus launches its young forth into the wide ocean of life.

A naturalist of less extensive and varied acquirements than AGASSIZ would probably have had the greatest difficulty in identifying the specimens with any known adult fish, because the forms of the young in these classes are so entirely different from mature ones of the same species.

There were umerous species from which, by the ordinary methods of determination, these individuals could not be distinguished; but the mature man was not to be so easily baffled in a branch, for the sake of which he endured privation in his early days, and on which, when still a mere youth, he lectured before the grey-bearded members of the Royal Geological Society. He bethought himself of the studies he made in former years with the view of determining the species to which fish belong from the pigment cells of the skin. A brief examination, and a comparison of skin of these little infant fish, hatched on board the vessel, with that of known varieties, showed that the nest belonged to a fish known as *chironectus pictus*, which has a wrist-like appendage to the pectorial fins bearing projections which resemble fingers; from this peculiarity the fish has been named.

It may be said that after all, though this is very well, it is not probable that the world will be greatly benefitted by the discovey, still it appears to us that the world might draw one lesson from it which would be of great benefit, and that is regarding the value of thoroughness. By being thoroughly master of his science, AGASSIZ has been able to accomplish a deed, of which both he and the scientific world generally may well be proud. Is natural history the only branch in which such exceedingly desirable results can be attained by the same means?

Rothwell's Map of the Coal Reg

In another column will be found the advertisement of this large and elaborate map, a limited number of copies of which are now offered for subscription to those engaged in the mining and shipping of coal in the Wyoming and Lackawanna fields, and to geologists, engineers and technical schools. A large amount of time and labor on the part of Mr. ROTHWELL, as well as a liberal expenditure of money, was involved in the preparation of this map; and it has thereby acquired a commercial value which could have been conferred in no other way.

The entire map is from original surveys, by Mr. ROTHWELL and his corps of assistants. Each of the closed surveys was tabulated and balanced. If the survey did not close within one in six hundred, it was rejected and verified. The larger surveys closed within one in two to three thousand.

The contours are for every ten feet vertical, the base of elevation being mean tide-water level. The lines of railroad and railroad surveys afforded a number of lines of levels running through the valley from end to end, the intermediate levels being taken with the aneroid barometer and carefully verified.

The division of the map into one-mile squares, by true north and south, and east and west lines, greatly facilitates its use in estimating distances. Nearly two hundred of these squares are shown on the map, and as each square was reduced separately from a scale of one to six hundred to that of the present map, which is one in a thousand, the requisite accuracy is fully secured. It is printed from six stones and can be mounted in six, three or two pieces, or on one sheet. In the latter form it is 15 feet long and 42 inches wide.

The ground covered is about three quarters of the Wyoming and Lackawanna coal fields, extending from Blakely, some four or five miles east of Scranton, to the western extremity of the valley, while in width it includes the mountains which on each side of the valley limit the coal fields. All the collieries, lines of property and names of land-owners are given with accuracy, and the workings of the mines can easily be supplied on any copy. The coal beds in the great majority of cases follow the undulations of the surface, so that the contour lines are generally a very good indication as to the direction of water-level gangways; they show, also, how much of a property can by drained by adit levels, etc.

The contour work is remarkably well done, and in this respect the map is among the finest specimens we have ever seen.

The limits of properties owned, or worked by companies now in actual operation, are colored so that the eye catches them at once.

The map is almost indispensable to all companies or individuals owning lands or mines in this region, or dealing in such property. The information which it contains is vast in amount, and though not given in an ostentatious way, it is none the less clear and reliable. Much of this information may possess but little *immediate* value to each company or each operator; but they are liable at any time to need a portion of it, to obtain which would involve a greater outlay of money than the entire map now costs. A considerable portion of the information is general and of equal value to all, while another portion is of particular value to each company or operator, as showing accurately the position of their lands with reference to the lines of transportation and to each other. The map will be found also a valuable work of reference for libraries and public institutions, as a practical means of instruction and information.

Improvements in Mine Pumps.

The French journal *La Houille*, of December 7, gives some particulars of a very remarkable pump recently erected at the Saint Marie pit, Blanzy Mining Company, Monceau les mines, France, by the company's engineer, M. H. AUDEMARD. The depth of the pit is 340 metres, or 1,115 feet. A lodgement or chamber eighty-two feet long, twenty-six wide and twenty-three high, is cut in the rock at 131 feet above the foot of the shaft. A set of lift pumps takes the water from the sump at the foot of the shaft and delivers it in a reservoir in this lodgement, where the sand and mud has an opportunity to settle. From this point the water is forced to the surface in a single lift of *nine hundred and eighty-four* feet, by means of four horizontal plunger-pumps, driven in pairs direct off the piston-rods of two coupled horizontal engines of about two hundred and fifty horse power; the other ends of the piston-rods are connected by cranks to the main fly-wheel shaft. The engine is supplied with steam from boilers on the surface, through a pipe 7.87 inches in diameter, and 1,312 feet long. There are, of course, arrangements for taking care of the water (condensed steam) and for the contraction and expansion of the pipes. The loss of pressure between the boilers and engine is given as about three-tenths of an atmosphere, say 4½ lbs. The four plunger-pumps discharge into a common air chamber, and the column-pipe is carried up one side of the shaft, the same buntings supporting it as carry the steam pipe.

The lift-pumps are worked from the same engine by means of rocking-bobs and rods.

The packing of the plungers is composed "of three leathers laid one over the other, and cut out *emboutis;* a fourth, also cut out, but in the opposite direction, to protect the pump barrel from the reëntrance of air; and a fifth leather, which intercepts the lubricator placed in an annular crown round the plungers."

This kind of packing, notwithstanding the enormous pressure to which it is subjected, appears to last very well. The joints are boxed and packed with rubber confined in its place.

The most important feature in the pump is M. AUDEMARD's patent valve. Instead of the conical or flat-seated valves generally used, M. A. has sought to reduce the width of the seat to a minimum, for the double purpose of reducing the movement of the valve and in order to keep the pressure per square inch about the same on top and bottom. This he has effected by making the valve convex, so that its bearing on its seat is merely a line; and since the pressure on the valves is enormous (say 430 lbs. per square inch), and the seats must be of the hardest material, they are of cast steel. The ease with which these valves work may be judged by the fact that the pump makes *eighteen* strokes per minute, and the movement of the valves *can scarcely be heard.* The cost of the pump, including the making of the main shaft chamber or lodgment, and the putting in of everything complete, is given at about $70,000 (350,000 francs), while it is estimated that Cornish pumps of the ordinary type to do the same work would have cost over $200,000.

The desirability of using pumps under such enormous pressures has often been questioned; and it is generally conceded that where the lift exceeds 350 feet it is more econonomical to make two lifts than one, partly on account of the less weight of the parts, and the greater ease with which repairs are made, but more especially because the wear and tear of the valves, and consequently the liability to stoppage, is greatly increased by working under these heavy pressures. We note with interest the use of cast steel by M. AUDEMARD in his patent valves and seat, the advantage he obtains from the form of the valve, in reducing the movement of the valve. It appears doubtful, however, if even this will so reduce the liability to stoppage as to make it desirable to follow his bold example in other than exceptional cases. The use of cast steel would be impracticable in the acid waters of our anthracite mines, which will sometimes cut through a steel shovel in twenty-four hours; but probably aluminum bronze, or some other hard alloy, may answer even better than steel.

There is a decided advantage in placing the boilers on the surface rather than below ground, as has generally been the case where underground pumps were used. In fact, with steam pipes of a suitable diameter, and properly protected against radiation, the loss of pressure in carrying steam to great distances is very small. We have instances of carrying steam 2,800 feet with a loss of only two pounds. In this case the steam pipe was laid inside a second pipe. Where this is done, and the exhaust (in non-condensing engines) is carried up through this outer pipe, there is but very little loss. The outer pipe can be segmental, so as to render the inner pipe more easily accessible. In most cases, however, a felt covering or a wooden box, affords a sufficient protection; and even if the loss of steam were much greater than it is, it would be more than outweighed by the greater cost of establishment, and the inconvenience, and often danger, in working boilers under ground.

M. AUDEMARD placed his pump at a height of 131 feet in the shaft, so as to be safe in case of an accidental or intentional flooding of the mine—a disposition that could be adopted with great advantage in many of our mines, where direct-acting steam pumps are used.

There are many particulars not given in *La Houille* which would be interesting to the engineer, as for example the diameter and stroke of the engine and pumps, the size of column-pumps, and the valve-openings, the valve movement in fuller detail, &c.; but the above account cannot fail to be of interest, and will undoubtedly lead some of our enterprising engineers to devise plans by which this great French pump will not stand without a rival.

The Death Valley Mineral Region.

NEWVILLE, Penn., Dec. —, 1871.

To the Editor:

SIR: Allow me to give you a little of my personal experience in a part of the country which I think is deserving of attention.

About 1860, I, at the head of a party, commenced prospecting for mineral, in that portion of California east of the Sierra Nevada Mountains, and west of the then line of Utah and Death Valley, comprising an area of one hundred miles in length, and, perhaps, fifty in width. We found the country, in spots, exceedingly rich in mineral. Here I operated in different districts for seven years. But at the end of that time we had to drop our tools and turn our backs on years of hard work, leaving the country in one sense a worse waste than we found it. We had failed entirely to "make it pay."

We then thought to induce capitalists to assist in more extensive plans to resume operations; but in this also we failed; and, heart-sick, worn-out and penniless, we have scattered to the four winds, utterly abandoning all our right, title and interests in the region we explored. It is easy to show you the causes of our failure to make the mines pay. By looking at a map, you will see Walker's pass (I think it is now in Kern County) to the east of which and between it and Death Valley are the districts of Coso, Telescope, Slate Range, and Elpaso. Intervening between the pass and these districts is one vast sea of deep sand. From the Pass to Coso, the distance is about thirty-five miles; to Telescope, forty miles; to Slate Range, forty; and to Elpaso, twenty-one miles. We had no means of obtaining supplies, except by pack animals, a slow and very expensive manner of supplying a mining camp. This fact, together with the want of water and fuel in the districts, for steam and mill purposes, rendered it impossible for us to work profitably, although all the ores (gold) we ever worked, yielded from sixteen to thirty dollars per ton—a high average for quartz, as you know. We stuck to it for seven long years, in hopes that by going deeper we would ultimately find rock sufficiently rich to yield a profit even under such disadvantages; but our means of subsistence failed, and we accomplished nothing beyond the development of inexhaustible quantities of gold ore.

I might here add that a mill of eight stamps was built in Coso, and one in Slate Range, but the small supply of water and fuel never permitted them to run more than four hours per day, after the first two or three months. The fuel was principally sage brush and curris-wood, the latter resembling in appearance a scrub hazel bush.

There are in these districts not less than five hundred well-defined ledges of gold and silver ore, ranging in width from two to forty feet, to say nothing of large quantities of iron, copper and zink. The silver, as yet, beyond a thorough prospecting, has never been touched more than to send small quantities of the ore to San Francisco, to test its value, which, in all cases, proved remarkably high.

For the successful development of this isolated and now utterly uninhabited region, nothing is needed but to put it in communication, across the thirty or forty miles of sand desert, with Walker's Pass, and the Sierra. The mountains are covered with abundant redwood and oak timber, and westward from the Pass flows the beautiful Kern river, affording an ample supply of water. A narrow gauge railroad might be laid, without expense of curves or grading, to one district or large mine, and afterwards, if advisable, shifted to another; and the ores could then be cheaply transported and cheaply reduced at the mountains. The parties owning such a road would have the virtual monopoly of the Death Valley mineral region; and, indeed, in view of the impossibility of developing the resources of that country in any other way, might well be protected by legislation in such a right. The cost of the plan would not be greater than the sums frequently expended in opening single mines; and the profits, before deep mining became necessary, would be sufficient to repay it.

I will cheerfully furnish further information on the subject to any who seriously desire it.

W. S. MORROW.

The Hassler Expedition.

The following letter from Professor AGASSIZ to the Superintendent of the Coast Survey has been received, and will, we think, be read with interest:

ST. THOMAS, Dec. 15, 1871.

MY DEAR PROFESSOR—For several days after we left Boston, I was greatly troubled by a sense of weakness, so much so that more than once I thought I had undertaken more than I had strength for. But as soon as we got into warmer latitudes, I felt better, and now I am actually improving beyond my condition at the start. As soon as we reached the Gulf Stream we began work. Indeed, Pourtales organized a party to study the temperature as soon as we passed Gay Head, and he will himself report his results to you, which are quite interesting. My attention was entirely turned to the Gulf weed and its inhabitants, of which we made extensive collections.

Our observations favor the view of those who believe that the floating weed is derived from plants torn from the rocks upon which sargassum naturally grows. I made a very simple experiment, which seems to me to settle the matter. Every branch of the sea weed which is deprived of its floats, at once sinks to the bottom of the water, and these floats are not likely to be the first parts developed from the spores. Moreover, after examining a very large quantity of the weed, I can say that I have not seen a branch, however small, which did not exhibit distinct marks of having been torn from a solid attachment. You may hardly feel an interest in my zoological observations; but I am sure you will be pleased to learn that we had the best opportunity of carefully examining most of the animals known to inhabit the Gulf weed, and some which I did not know to occur among them. However, the most interesting discovery of the voyage thus far is the finding of a nest built by a fish, floating on the broad ocean with its live freight. On the 13th of the month, Mr. Mansfield, one of the officers of the Hassler, brought me a ball of Gulf weed which he had just picked up, and which excited my curiosity to the utmost. It was a round mass of sargassum about the size of two fists, rolled up together. The whole consisted, to all appearance, of nothing but Gulf weed, the branches and leaves of which were, however, evidently knit together, and not merely balled into a roundish mass; for, though some of the leaves and branches hung loose from the rest, it became at once visible that the ball was held together by threads trending in every direction, among the seaweeds, as if a couple of handfulls of branches of sargassum had been rolled up together with elastic threads trending in every direction. Put back into a large bowl of water, it became apparent that this mass of seaweeds was a nest, the central part of which was more closely bound up together in the form of a ball, with several loose branches extending in various directions, by which the whole was kept floating.

A more careful examination very soon revealed the fact that the elastic threads which hold the Gulf weed together were beaded at intervals, sometimes two or three beads being close together, or a bunch of them hanging from the same cluster of threads, or they were, more rarely, scattered at a greater distance one from the other. Nowhere was there much regularity observable in the distribution of the beads, and they were found scattered throughout the whole ball of sea-weeds pretty uniformly. The beads themselves were about the size of an ordinary pin's head. We had, no doubt, a nest before us, of the most curious kind; full of eggs, too; the eggs scattered throughout the mass of the nest and not placed together in a cavity of the whole structure. What animal could have built this singular nest, was the next question. It did not take much time to ascertain the class of the animal kingdom to which it belongs. A common pocket lens at once revealed two large eyes upon the side of the head, and a tale bent over the back of the body, as the embryo uniformly appears in ordinary fishes shortly before the period of hatching. The many empty egg cases observed in the nest gave promise of an early opportunity of seeing some embryos freeing themselves from their envelope. Meanwhile a number of these eggs with live embryos were cut out of the nest and placed in separate glass jars to multiply the chances of preserving them, while the nest as a whole was secured in alcohol, as a memorial of our unexpected discovery. The next day I found two embryos in one of my glass jars; they occasionally moved in jerks, and then rested for a long while motionless upon the bottom of the jar. On the third day I had over a dozen of these young fishes in my rack, the oldest of which begin to be more active, and promise to afford further opportunities for study.

I need not relate in detail the evidence I soon obtained that these embryos were fishes; suffice it to say that the dorsal cord with its heterocercal bent was readily visible, as well as the caudal fin with its

rays; in the eyes the coloboma had not yet been fully closed, and blood currents were unmistakable upon the yolk bags. But, what kind of fish was this? About the time of hatching, the fins of this class of animals differ too much from those of the adult, and the general form exhibits too few peculiarities to afford any clue to this problem. I could only suppose that it would probably prove to be one of the pelagic species of the Atlantic, and of these the most common are exocoetus, naucrates, scopelus, chironectes, syngnethus, monacanthus, tetraodon, and diodon. Was there a way to come nearer to a correct solution of my doubts?

As I had in former years made a somewhat extensive study of the pigment cells of the skin, in a variety of young fishes, I now resorted to this method to identify my embryos. Happily, we had on board several pelagic fishes alive, which could afford means of comparison, but unfortunately the steamer was shaking too much, and rolling too heavily for microscopic observation of even moderately high powers. Nothing, however, should be left untried, and the very first comparison I made secured the desired result. The pigment cells of a young chironectes pictus proved identical with our little embryos. It thus stands as a well-authenticated fact that the common pelagic chironectes of the Atlantic (named chironectes pictus by CUVIER), builds a nest for its eggs, in which the progeny is wrapped up with the materials of which the nest itself is composed; and as these materials are living Gulf weed, the fish-cradle, rocking upon the deep ocean, is carried along as an undying arbor, affording at the same time protection, and afterward food for its living freight.

This marvellous story requires additional interest, if we now take into consideration what are the characteristic peculiarities of the chironectes. As its name indicates, it has fins like hands, that is to say, the pectoral fins are supported by a kind of prolonged, wristlike appendages, and the rays of the ventrals are not unlike rude fingers. With these limbs these fishes have long been known to attach themselves to seaweed, and rather to walk than to swim in their natural element. But now that we have become acquainted with their mode of reproduction, it may fairly be asked if the most important use to which their peculiarly-constructed fins are put is not probably in building their nest. The discovery of this nest was quite accidental, but not so the examination of the large masses of the floating weeds which we met with as soon as we entered the water of the Gulf Stream. I had made it my chief business to examine the floating sargassum, with the intention of solving, if possible, the question of its origin. I had delivered a lecture to all on board, in which was stated all I know upon the subject, and what I wanted to ascertain further; thus hoping to enlist the interest of the officers of the ship, and of my scientific fellow-travelers in the object of my search. I had told them that I did not believe that the Gulf weed could multiply while floating, even though the floating branches might enlarge. I had suggested the gathering of the smallest branches of the weed, with a view to ascertaining whether not all, even the very smallest, bore signs of having been torn violently away from a fixed attachment. From that day, not a patch of Gulf weed passed our ship within reach that was not carefully looked at, and hauled up, if it presented any peculiar appearance, and no doubt I have my reward for that lecture in the discovery of the nest of chironectes. There remains one closing chapter to add to this story. May some naturalist, becalmed among the Gulf weed, have the good fortune of witneseing the process by which the nest is built. From an embryological point of view, these little fishes are quite interesting. In the first place, the embryonal vertical fin, which extends along the whole back in the fish embryos thus far known, begins very far behind in the young chironectes, and does not exist upon the neck and back. In the second place, the position of the heart is very peculiar. Instead of lying at the junction of the yolk-bag with the head, it occupies a low position in the front part of the yolk.

All the officers of the Hassler are indefatigable in their efforts to help our investigations, and even the men show useful interest in our proceedings. We have just reached St. Thomas, so that I have nothing to add as to observations made here.

Ever truly your friend, L. AGASSIZ.

To Prof. BENJAMIN PEIRCE, Supt. U. S. Coast Survey.

Polytechnic Association of the American Institute.

Meeting held Dec. 22, 1871. Prest. S. D. TILLMAN in the Chair.

The President read the following scientific notes:

I. A SOLAR EXPLOSION.—Prof. YOUNG, of Dartmouth College, on the 7th of September last, at 12:30 P. M., was examining, by means of his spectroscope, an enormous flame or hydrogen cloud, on the eastern border of the sun, about 100,000 miles long and 54,000 miles high, its lower surface being at last 15,000 miles above the visible border of the sun, to which it was connected by three or four bright columns. Such was its appearance when he left the telescope; on returning, within half an hour, he was surprised to find this vast projection had been literally blown to shreds by some inconceivable force from beneath. In place of the quiet cloud, the air, to use his expression, was filled with flying *debris*—a mass of detached, vertical, fusiform filaments, which continued to rise with a motion almost imperceptible until the uppermost were more than 200,000 miles above the solar surface. As they rose they gradually faded away like a dissolving cloud, and at 1:15 P.M. only a few filmy wisps, with some lighter streamers low down near the chromosphere, remained. In reference to the supposed disturbance of the earth's magnetism by changes in the sun's atmosphere, he says: Whether the fine aurora-borealis which succeeded in the evening was really the earth's response to this magnificent outburst of the sun is perhaps uncertain, but the coincidence is at least suggestive, and may easily become something more if the Greenwich magnetic record indicates a disturbance precisely simultaneous with the solar explosion.

II. MAGNETIC PERTURBATIONS.—The so-called Solar explosion recently described by Prof. YOUNG, of Dartmouth College, did not (contrary to his expectations) produce a specially-marked simultaneous disturbance of the magnets in Greenwich Observatory. Professor AIRY, of the Observatory, in answer to Professor YOUNG's inquiry on the subject, writes: "The day was one of magnetic disturbance, but it does not appear that any remarkable movement coincided with the beginning of your observation. There was a sudden movement nearly at the end." It seems probable, therefore, that these rapid and extraordinary movements of the most rarified portion of the sun's atmosphere do not produce such magnetic disturbances at the earth as have been frequently observed when solar spots appear which indicate that an actual opening has been made completely through the solar atmosphere.

Dr. VAN DER WEYDE—In the spectroscope, the corona of the sun, the aurora-borealis, and the zodiacal light produce the same lines. There is a relation between the aurora-borealis, and also between solar disturbances and magnetic disturbances. That the aurora-borealis affects the compass needle is well known. I have at my house a delicate compass needle, carrying a mirror reflecting a scale at some distance from it, so that the slightest motion of the needle is visible. On one occasion I saw, in the afternoon, that the needle was very uneasy, and concluded that there was an aurora, invisible in consequence of the daylight. As soon as it was sufficient dark the aurora became visible.

Mr. STETSON inquired if it had been demonstrated, by any sufficient series of observations, that there is any relation between spots on the sun and magnetic or other disturbances on the earth.

Dr. VAN DER WEYDE remarked that there had been solar eruptions observed, and at the same instant, in two places, a change had been observed in the magnetic needle.

The PRESIDENT—If the earth is a magnet it is easy to see that any change in the sun should affect the magnetism of the earth. But in the explosion seen by Prof. YOUNG, the movement was of very light matter, and it is not surprising that the effect should have been so slight as to be imperceptible. The most plausible theory to explain the magnetism of the earth, is that it is due to the difference of the action of the solar heat on different parts of its surface. I asked Prof. MEYER last night, after his lecture on Magnetism, why he did not speak of the cause of the earth's magnetism. He replied that although the theory is very plausible, he was not prepared to endorse it positively; but simply to show the fact that the earth is a magnet. We had in that lecture one experiment which was never before made in the world; that the change of the galvanometer was visible to the whole audience, being reflected upon a screen, on Prof. MORTON's plan the galvanometer being placed below a vertical lantern.

Dr. VAN DER WEYDE—A great many experiments in magnetism have heretofore been such that they could be seen by a dozen persons at most. But the use of the vertical lantern allows a whole audience to see the results of such experiments. The nearest approach to this plan was that which I have tried, throwing the image upon the ceiling; but Prof. MORTON's plan is far superior. The experiments themselves, which were exhibited last evening, were not new; but they have never before been exhibited to a large audience.

The first person to announce the theory that the earth's magnetism is caused by the solar heat was BARLOW. But there are two objections to that theory. One is that the action of a sun-spot is so immediate. If it is the result of currents it should take some time. It takes three hours to get the maximum of heat; it does not occur when the sun passes the meridian. The velocity of the transmission of this influence is very great. The velocity of light is slow in comparison to it. There is positive proof that the transmission of gravitation is instantaneous, proof as certain as that the three angles of a plane triangle are equal to two right angles. It is very likely that the transmission of magnetism from the sun to the earth is instantaneous. The second objection is that it does not explain the rotation of the magnetic pole around the geographic pole. There are two north poles; but the principal one is in this country now. Two hundred years ago it was in Europe; and it is now going back towards Europe. The cause of this is unknown. It may be that the earth is magnetic by induction chiefly.

The PRESIDENT—I do not accept the force of the first objection; for our knowledge of the time of the formation of a sun spot is derived from vision, depending upon the motion of light. The instant a person can see a sun spot, that instant the effects of the heat of the sun is felt upon the earth, and, of course, at that instant it should effect the needle. As to the other objection, the position of the magnetic pole, it will be found, upon examination, that if a magnetic pole were to be produced as the effect of the solar heat, it would be produced exactly where it now exists, and that is one of the strongest reasons for accepting this theory.

Dr. VAN DER WEYDE—If the solar heat were the cause, I should expect the magnetic currents to run parallel to the equator, for at all seasons of the year the apparent rotation of the sun is always at right angles with the axis of the earth. Besides, the currents should be the greatest where the heat is the greatest. The magnetic meridians and parallels are very irregular, indeed.

The PRESIDENT—That is another reason for the theory, because the earth's surface is very uneven, and the thickness of the earth's crust is very unequal, and the currents should be the strongest where the heat is the least.

III. DISTANCE OF DOUBLE STARS.—The distance of nearly all the fixed stars being so great that observations of the same star at opposite points of the earth's orbit form no parallax. The astronomer has heretofore been baffled in his attempts to estimate, even approximately, the remoteness of these celestial bodies. Mr. Fox Talbot has proposed to use the spectroscope in the following manner for effecting this object in binary systems: Suppose the plane of the orbit of a binary system to pass through the sun, *i. e.*, that the observer is in the plane of the orbit, and that in the spectra of the individual stars there are lines belonging to the same element. The spectra of the two stars, taken through the same slit, should be observed and compared. When the stars appear in the same straight line, it is clear that their velocities relative to the earth are the same, since both are moving, perpendicularly, to the line of vision; the lines from the two stars will, therefore, coincide. But when their apparent distance from each other is greatest, the difference of their velocities relative to the observer is equal to the velocity of either star, in its velocity in its orbit about each other. This difference will produce a displacement of the lines, which may be observed and measured. This gives the value of that velocity; but we know, also, the periodic time. We have, then, at once, the circumference and the diameter of the orbit. We know the greatest angular distance between the stars; we have, then, the distance of the stars from the earth.

The PRESIDENT—Mr. Rutherfurd has been quietly doing a work which will be consulted 50,000 years after we are forgotten, in photographing groups of stars, by which their positions are exactly recorded, without the error of personal equation. Mr. Chapman, who is associated with him in this work, is present to-night, and we would like to hear from him some account of that work.

Mr. CHAPMAN—The groups of stars are photographed twice a year, six months apart. The telescope takes directly a field of about two degrees. There is a little distortion, but that can be ascertained mathematically and applied as a correction. Some of the groups contain as many as 125 stars, down to the ninth magnitude, taken upon a plate 5½ inches square. A star suspected of proper motion is placed in the centre of the plate. The plate is exposed six minutes, and then the telescope is moved slightly and the plate is exposed six minutes longer, duplicating all the stars upon the same plate, so as to identify them from other spots upon the plate and verify their positions. Then the clock-work is detached, and, after a certain length of time, the clock is again attached and a supplemental exposure is made, which furnishes us the base line, or zero of position. With the micrometer, each star is determined in position by its distance from the central star and by the angle of the line from it to the central star with the east and west line. In order to get rid of any constant error from the direction of the telescope, we usually take the stars with the telescope first on one side of the pier, and then, when the stars are in a different position, with the telescope upon the other side of the pier. By repeating the groups six months apart, we hope, by and by, to ascertain the amount of parallax of some of them. We thus have an absolute map of these groups for future use. On a cloudy day a young lady sits down and measures the positions of those stars.

Dr. VAN DER WEYDE—Will you explain about making the telescope achromatic for the actinic rays?

Mr. CHAPMAN—The first object glass, that which Dr. Gould now has at Cordova, was corrected for the actinic ray alone. The ordinary photographic lens is a compromise between the visual and the actinic rays. The 13-inch objective we now have was first corrected for the visual rays as perfectly as possible. Then a flint glass meniscus lens was constructed to be placed in part of the objective, shortening the focus about one-seventh, which was corrected by the aid of the spectroscope, until the whole combination was perfectly corrected for the actinic rays.

IRON DEPOSITS IN ALABAMA.

Mr. COLTON gave a description of the iron deposits in Alabama, and exhibited specimens of the ore, after which Mr. ABRAM S. HEWITT followed with remarks on the same subject, which were published in our last issue.

Mining Summary.

The snow on the Pacific road has cut off recent intelligence from the Pacific mining country, and our readers will doubtless notice that our usual installment of mining news is omitted this week.

Rapid City Transit.

We make the following extract from an article on the above subject in the *Railroad Gazette*.

There are two or three rival companies, with pet schemes for solving the difficulty, which they are carefully nursing, and loudly calling on the public to admire and adopt. To add to the complications of the question, Mr. VANDERBILT has built his immense depot on Forty-second street, and turned the traffic of three railroads into one of the main avenues of the upper end of the city, thus bisecting it, and making communication from one side to the other difficult and dangerous. Numbers of people have been killed and maimed, and the noise along the line of the road has made the section of city bordering it, if not uninhabitable, at least sufficiently uncomfortable to depreciate very seriously the value of property in that part of the city. The trains—of which there are a great many—are run across the streets at the level of the latter, with a regard for human life hardly greater than would be shown if the road was located on a Western prairie. Quite naturally the property-holders are clamorous for some mitigation of the evil, but it seems to be conceded that the location of the depot and its approaches was a great blunder. Of course under all these circumstances a solution of the difficulties becomes an engineering problem of very great importance, and one in which the services of the ablest men in the profession should be enlisted, which, we regret to say, does not seem at all probable; but upon the contrary it is now in the hands of contending factions whose deliberations have often more the character of a political caucus than of scientific investigation. The next session of the Legislature will probably be the battle-field, and as indications now are, it seems probable that the leading railroads which enter New York have become interested parties in one of the schemes, so that if there is a contest this winter, those who engage in it must marshal strong forces.

Of course immense diversity of opinion exists in relation to the whole subject, and almost any man you meet in New York has very decided opinions in favor of or opposed to elevated, subterranean or depressed roads. Such opinions are of course generally based on mere rumors, prejudice or personal interest; and it is safe to say that very little accurate knowledge exists in relation to the subject. Inasmuch as some *system* of rapid communication and travel from one end of the island to the other is a vital necessity, and one to which a great many collateral interests attach; and considering the want of accessible information, the wisest plan altogether would seem to be the appointment of a commission, consisting of some of our ablest engineers, capitalists, property-holders and a lawyer or two, to systematize the inquiries, with authority to take evidence, make surveys and "send for persons and papers," and, in fact, make an exhaustive report on the subject, and make it and all the evidence upon which it is based accessible to the public. The organization of such a commission would, of course, be attended with political dangers; but probably the appointing power could be most safely lodged in the hands of the Governor. Such an investigation would, of course, require considerable time, which would be fully justified by its importance. In such a matter as this, which involves the welfare of hundreds of thousands, doubtless of millions in the future, and affects the value of millions of property, too much pains cannot be taken, not merely to select a feasible plan, but the best one. Indeed, its very execution depends chiefly upon its excellence. Just so soon as it has been made reasonably certain that a city railroad on a certain plan will be profitable, it will be easy to obtain all the money, however great the amount needed to execute it. The owners of the land in the upper part of the island and in Westchester county alone could well afford to pay for a road which will carry passengers from Harlem Bridge to the City Hall in half an hour. With it Harlem would be as accessible as Twenty-third street, and Yonkers easier to reach than Central Park. And the effect of such a road would have advantages for the residents of the lower part of the city, even if it should not be used by them. It would be a constant competitor with the horse railroads, and would compel them to increase their accomodations, and offer some inducements to passengers, which they can hardly be said to do now.

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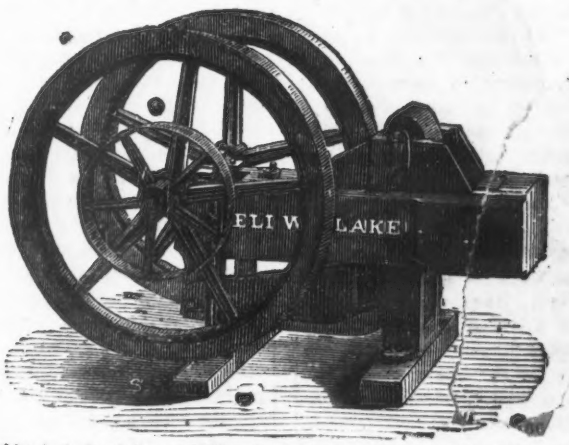

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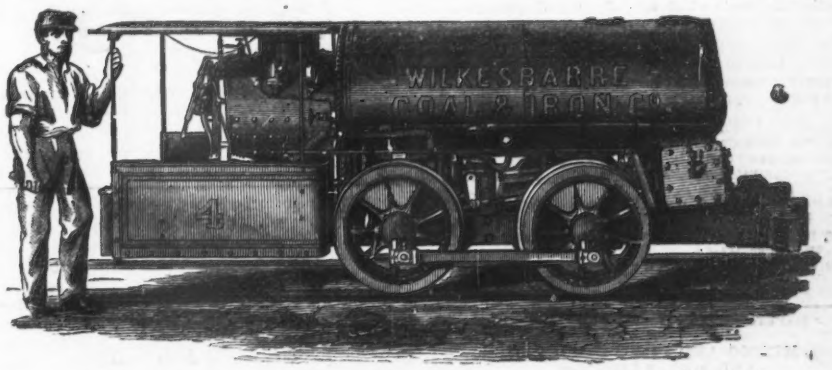

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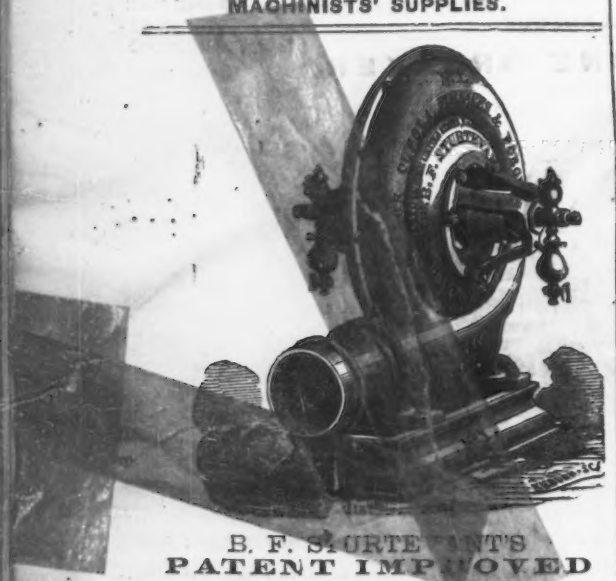

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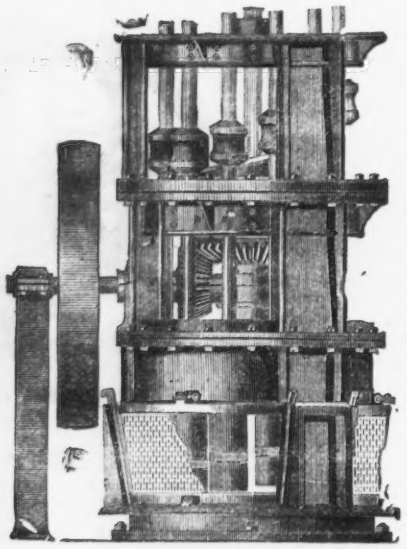

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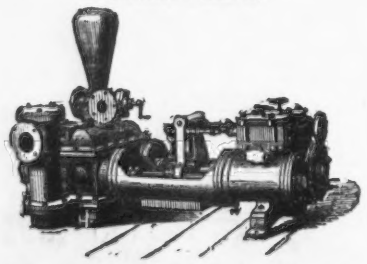

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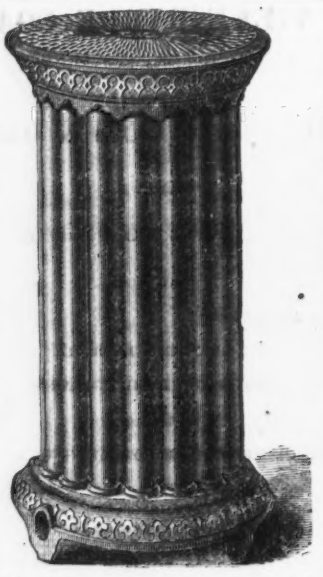

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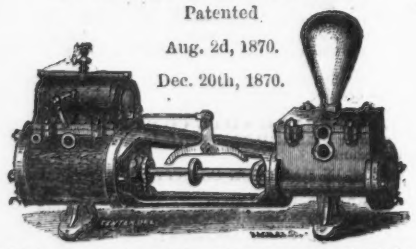

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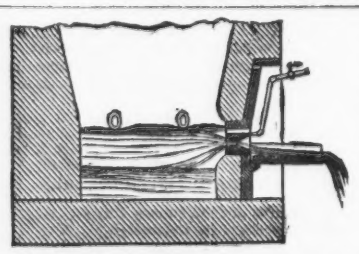

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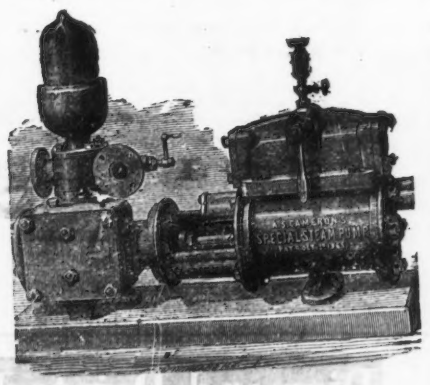

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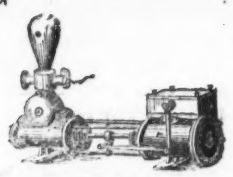

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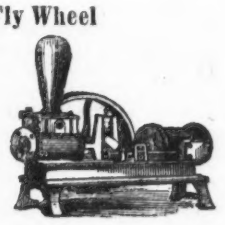

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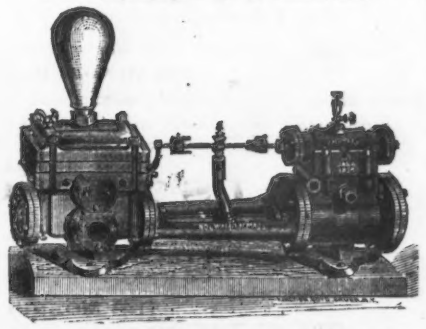

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